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CURRENCY SWAP
FOR A BANK IN HONG KONG:
PRICING, ENVIRONMENTAL FACTORS
AND COMMERCIAL NEEDS

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RESEARCH REPORT

Presented to

The Graduate School

In Partial Fulfilment

of the Requirements for the Degree of

MASTER OF BUSINESS ADMINISTRATION

TWO-YEAR MBA PROGRAMME

THE CHINESE UNIVERSITY OF HONG KONG

May 1984

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ACKNOWLEDGEMENTS

The researchers would like to express their sincere thanks to several lecturers of The Chinese University of Hong Kong. They are Professor Robert H. Scott, Dr. Y.K. Ho, Mr. Patrick S. Chan, and Dr. Lawrence S. Tai. Their information and advice have assisted the researchers in constructing the framework of the project and in conducting the financial analysis.

The researchers are also deeply indebted to Professor John L. Espy for his advice and guidance; and to Mrs. Scott for her helpful comments on the write-up of the project. Finally, the researchers wish to give their sincere thanks to Mr. Alex C. Li and Mr. Stephen Yau of the Citibank N.A. for their valuable information and guidance, without which we cannot have discovered the "currency swap".

ABSTRACT

In recent years, currency swaps are drawing much interest from international bankers and corporate treasurers. The art of currency swaps has been quite well-developed in the United States and European Capital Markets. However, not many swap transactions have been arranged in the Asia Pacific region.

Opportunities exist for international banks in Hong Kong to act as intermediaries between the counter-parties of a currency swap. In many cases, the intermediary bank has to offer long-date forward contracts to the parties. The bank then takes up the foreign exchange exposure. The pricing of the forward contract is therefore a very important feature of currency swaps. In addition, pricing also involves the bank's charges for hedging fee, front-end fee and commission.

In the Asia Pacific region, it is expected that the potential for doing currency swaps lies in US dollar/yen swaps. The liberalization of the Japanese financial system and the attitude of the Ministry of Finance towards swaps are the critical factors for the potential to realise.

Analysis of the commercial needs for currency swaps should be done along industry lines. Two analysis are performed in this report: China's offshore oil ventures and the shipping industry. Great potential exists in both industries. Yet there are some limitations and difficulties.

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CHAPTER I

INTRODUCTION

> "Swaps have altered the financial map. No treasurer, or country for that matter can afford to sit back and wait."
> (Andrew Large, SBCI[1])

> "Swaps are the greatest challenge yet to the agile banking mind, and like the study of the universe itself, there is no horizon."
> (Euromoney, November 1983, p.60)

In the financial world, the word "swap" is used to describe a number of financial techniques in foreign exchange, long-term financing, exposure management, and asset management in banking. In this research, the kind of swap studied is a long-term financing technique offered to treasurers and ministers of finance. Citibank can act as the intermediary for two or more counter parties, or, it can be one of the parties in a swap transaction.

As a long-term financing technique, swap can be categorized as interest rate swap and currency swap. Currency swap involves exchange of corporate debts, which are denominated in different currencies, between (among) the parties, while interest rate swap involves exchanges denominated only one currency.

Today, the major motive for currency swap is the arbitrage between capital markets. In this fashion, the first major publicized currency swap was arranged by Salomon Brothers for the World Bank and IBM in August 1981. Therefore, it is a fairly new concept in exploiting capital market inefficiency.

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[1]Mr. Andrew Large is the Chief Executive and Deputy Chairman of Swiss Bank Corporation International Limited (SBCI).

1.1 Purposes of the Project

This research is intended to explore the intermediary role of Citibank Hong Kong in arranging currency swaps for corporations in Hong Kong and the Asia Pacific region. As a lending centre , Hong Kong has been the locale for most of the long-term financing projects in the region. Moreover, Hong Kong is a major foreign exchange market. Therefore, Citibank, as an active player in the global swaps market and foreign exchange market, has much opportunity to arrange currency swaps for corporations in the Asia Pacific region.

Besides, emphasis has been paid on the pricing of the long-date forward contracts[1] in the currency swaps, since it is the current concern of Citibank's Treasury.

Since the currency swap is quite unheard of in Hong Kong, this research may also act as a pioneer study to stimulate further research on this powerful financing technique. Finally, this research also offers a chance for the authors to work on a practical issue and, through their effort, to benefit a real organization.

1.2 Research Objectives

Besides describing the swaps market and operation of currency swaps, this research contains four other main chapters. The first three cover the pricing, environmental factors, and commercial demand of currency swaps in the region. The last one contains recommendations and a conclusion.

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[1] "Long-date forward contracts" refer to forward exchange contracts which maturity is over one year.

Under "Pricing of Currency Swaps" (Chapter IV), a framework for pricing the long-date forward contract in currency swaps is analysed. In addition, the fees charged by an intermediating bank are also explored.

Under "Opportunities to Enter the Dollar/Yen Market" (Chapter V), the potential of the Dollar/Yen market is assessed. The characteristics of the Dollar and Yen capital markets are also analysed with reference to potential currency swaps.

Under "Exploratory Study on the Commercial Need for Currency Swaps in the Asia Pacific region" (Chapter VI), general market conditions for currency swaps in the region are discussed. Then, two industries with high potential use of currency swaps are investigated. They are the offshore oil ventures in China and the shipping industry in the region. Their need for this financing technique is explored.

Finally, under "Recommendations and Conclusions" (Chapter VII), the roles of Citibank's Treasury in the pricing of the long-date forward contract and currency swaps are discussed. Moreover, suggestions are made for Citibank's marketing strategy in the oil and shipping industries.

1.3 Scope of the Research

In Chapter IV, the pricing section focuses on analysing the conceptual framework for pricing and hedging the long-date forward contract. Considerations in the determination of swap fees will also be discussed. But, the exact determination of the fees is not included in this study.

In Chapter V, the analysis of environmental factors is a descriptive account of the Dollar and Yen capital markets. However, the technical operations in these two markets are left to Citibank's

practitioners to develop.

In Chapter VI, the market survey is an exploratory assessment of the market potential of the offshore oil ventures in China and the shipping industry in the region. Individual companies' potential is not analysed in this research.

Finally, in Chapter VII, discussion of the roles of Citibank's Treasury in long-term forward contracts and currency swaps is also only exploratory. Citibank's practitioners have the background and expertise to make a detailed and comprehensive investigation of this issue. In addition, the suggestions on marketing strategy are industry-oriented and are not narrowed down to individual companies.

1.4 Methodology

1.4.1 Literature Review

A literature review is chosen as the major basis for this research. Since currency swaps are sophisticated financial techniques, a literature review gives the foundation for analysing its opertations and the mechanism in pricing the long-date forward contract. As an exploratory study, literature review is also the best method to integrate analytical frameworks on currency swaps. Moreover, a comprehensive description of the characteristics of the Dollar and Yen capital markets is best obtained from library literature. Finally, a literature review is also an efficient tool for studying the industries' market potential.

1.4.2 Interviews

Comments and opinions from the staff of Citibank's Treasury and the lecturers of the Chinese University of Hong Kong were obtained through interviews. These interviews led to the construction of the objectives

and scope of this research. Moreover, they acted as guidance for keeping the project practical and useful.

1.4.3. Discussions

Since currency swaps are fairly new in Hong Kong, few people know about them. Informal discussions with professionals in the field were carried out to further explain the market to the authors. Moreover, the sophisticated mechanisms of currency swaps were also discussed and explored under various informal circumstances. However, the people involved in these discussions did not disclose their companies' roles in and plans for arranging currency swaps in the region.

CHPATER II

CURRENT DEVELOPMENT OF SWAP FINANCING

2.1 Origin

The basic concept of swap can be traced back to parallel loans in the 1960's. Parallel loans are paired loan agreements whereby one party, with excess liquidity in a particular currency, makes these funds available to a second party. In exchange, the second party makes an equivalent amount of a second currency in which it has excess liquidity available to the first party. An implicit forward contract exists because the principal will be repaid at an exchange rate fixed at the time the deal is made. In those days the primary role of paralled loans was to bypass the UK exchange controls by matching loans between UK and US parent companies and their local subsidiaries.

2.2 Emergence of Swaps

A swap shares many of the same purposes and characteristics of a parallel loan. However, in a straight currency swap, companies do not lend currencies but sell them to each other and, at the same time, enter into a commitment to buy back the same amounts at a fixed rate in the future.

When it was recognised that a swap was a simpler device, swaps began to replace parallel loans and emerge as an efficient fund-raising technique. The initial documentation of a currency swap is simpler because it involves only one agreement, not two loan agreements. Furthermore, security problems associated with the right of offset on one party's default can be circumvented.

But currency swaps are not used primarily to bypass exchange controls. Today, the major motive is to arbitrage between world capital markets in an era of floating exchange rates, which has existed since the abolition of the Bretton Woods Agreement.

In the late 1970's, Citibank entered the currency swap business. However, it was the World Bank, IBM and Salomon Brothers in August 1981 who did the first major publicized swap. That transaction brought swaps into the open and has been the main impetus behind the market's rapid growth.

Added to the power of currency swaps was the innovation of a related financing technique, the interest rate swap. With an interest rate swap, the nature of interest payments of a debt can be changed. The typical case is for two counter-parties to swap interest payments from fixed to floating and vice versa. This provides further flexibility for the operation of cross currency swaps.

2.3 Transaction Volumes

Because of the secrecy of swap transactions (in many deals, secrecy is a contractual requirement), it is very difficult to estimate accurately the size of the market or the volume of transactions conducted by a particular bank. Even when a deal is made public, the counter-party usually remains unidentified.

Euromoney estimated that the 1982 volume of currency swap was between US$5 and US$7 billion.[1] This was probably double the 1981

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[1] Simon Tait, "It Takes Two to Tango," Euromoney, February, 1983, p.75.

volume. The estimated volume of interest rate swaps for the same period was US$15 billion.[1]

2.4 The Major Players

According to a spokesman of S.G. Warburg, "There are only five or six major players, another half dozen who've done several transactions, and there are 30 to 50 other banks trying to do one deal."[2]

Citibank is a market leader in both interest rate and currency swaps. Being the biggest bank in the world, Citibank has a large client base for matching swap deals among its own customers. Besides Citibank, other big US commercial banks with well-developed investment banking arms have dominated the swap business. The leaders will continue as leaders because swap expertise can be built only over a long period of time. In rough order of swap volume, the big players are:

Citibank

Morgan Guaranty

Salomon Brothers

Morgan Stanley

Credit Suisse First Boston

Continental Illinois

S.G. Warburg

Bankers Trust

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[1] Advertising Supplement, Euromoney, January, 1983. p.61.

[2] "The Way into Any Market," Cover Story in Euromoney, November, 1983,

2.5 The Future

When bankers and financial journalists review the past two years, no report will be complete if swaps are omitted. It is not that they have dominated the international capital markets. Rather it is their potential that is considered to be important. The development of swap financing is still in its infancy. However, "as bond markets shorten in maturity and foreign exchange markets lengthen, the possibility of linking the two through the swap mechanism should add tremendous scope."[1]

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[1] J.A.M. Price, J. Keller and M. Neilson, "The Delicate Art of Swaps," Euromoney, April, 1983, p.118.

CHAPTER III

OPERATION AND BENEFITS OF A CURRENCY SWAP

3.1 Basic Ideas

A currency swap involves the exchange of debt into another currency until maturity. Basically, the two counter-parties exercise a spot currency transaction for the exchange of borrowings. At the same time, there is an agreement to reverse the currency transaction when repayment is made, often at a pre-agreed exchange rate. Additionally, each counter-party pays interest on the other's loan as if it were the borrower. Usually, a formula is worked out to take account of the interest rate differential and exchange rate differential over the term of the swap. Based on the forward rates generated, notional annual or semi-annual interest payments are netted out between the two parties, usually with the intermediation of a bank.

Compared with an interest rate swap, a currency swap is more complicated. The currency swap involves both interest rate and exchange rate differentials. The interest rate swap concerns interest payment in the same currency.

3.2 Variations of Currency Swap

A Currency swap is not a standardized product. There are always new possibilities to be considered. The swap engineer must constantly search for new combinations of markets. Each transaction has its peculiarities. Any swap package is a product of a different mix of markets, currencies, payment intervals, maturity, yield curves and risks. A change in regulations in a capital market or a corporation's tax considerations may trigger a new approach to the currency swap. It is an art that awaits fresh breakthroughs and innovations.

3.3 The Mechanism of Typical Currency Swaps

While there are tremendous variations, the basic swap mechanism can be understood by the discussion of three typical categories.

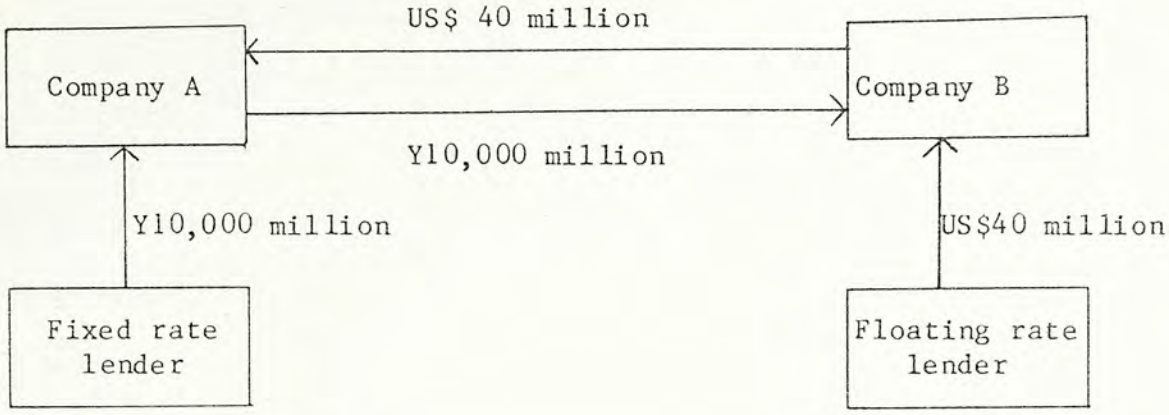
3.3.1 Cross Currency Floating to Fixed Debt Swap

This is similar to an interest rate swap in that one party converts a floating-rate liability into a fixed-rate liability. The main reason for this is the presence of credit anomaly. Banks and some large corporations are usually strong borrowers in that they can obtain fixed-rate funds by a public bond issue. But banks usually lend money out on a floating-rate basis. As a result, the less creditworthy borrowers are unable to fund themselves on a fixed-rate basis. With floating to fixed debt swap the less creditworthy borrower can borrow bank funds on a floating-rate basis and swap this funding into a fixed-rate basis by entering into a swap with the fixed-rate issuer.

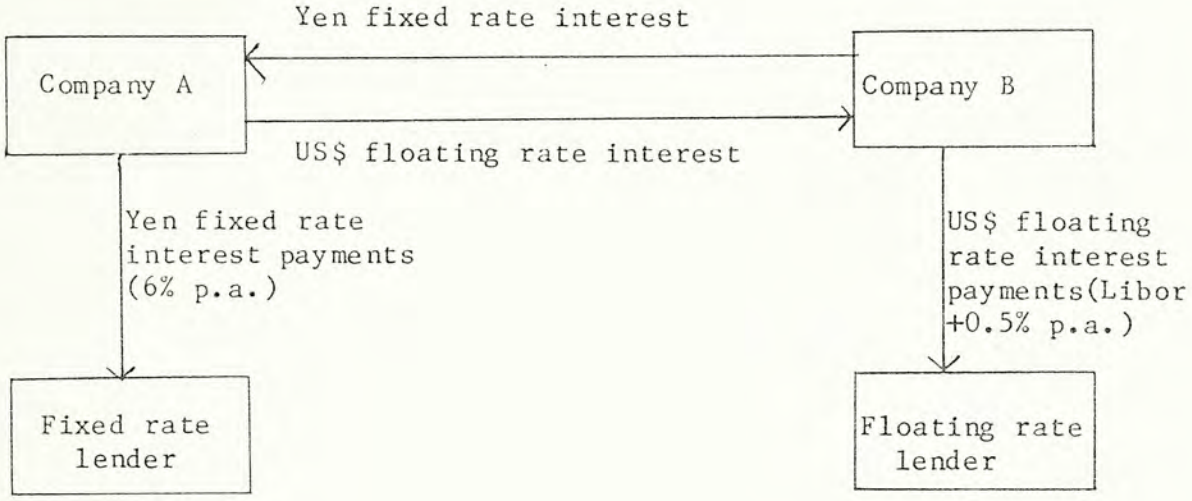
The cross currency floating to fixed debt swap also involves interest payments and principal repayments in two different currencies because the floating-rate finance is in one currency and the fixed-rate finance in another. Differing perceptions of who is a good risk in the world's various capital markets is the key.

Figure 3.1 describes the typical situation. Company A, a Japanese corporation, may borrow Y10,000 million from the Japanese capital market for five years at 6% payable annually. Company B may borrow the US dollar equivalent of Y10,000 million, say, US$40 million from the Eurodollar market, for five years at Libor plus a margin (say 0.5%) payable annually. Under a swap agreement, there is an exchange of currencies on day one. Moreover, Company A would agree to pay to Company B dollars equal to the interest payments and principal repayment due under Company B's floating rate loan on the appropriate future

Day 1



Annual Interest Payments



Principal Repayment (5th year)

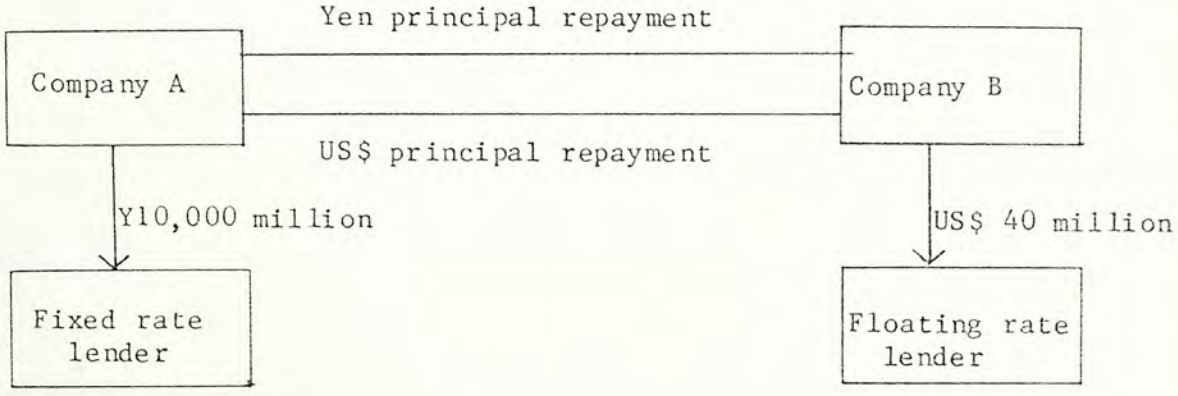


Figure 3.1 Cross Currency Floating to Fixed Debt Swap

payment rates. In return Company B would pay to Company A yen equal to the interest payments and principal repayment due under Company A's fixed-rate yen loan. Under this arrangement, Company A acts as a surrogate borrower of fixed-rate yen for Company B, and Company B as a surrogate borrower of floating-rate dollars for Company A.

The issue of creditworthiness previously mentioned may be relevant for a variety of reasons. For example, debt ratios employed by Japanese firms, although acceptable for the highest credit standing in Japan, are typically much higher than what would be considered sound by U.S. lenders. Hence a Japanese multinational seeking dollar funds to finance its U.S. subsidiaries is faced with high risk premium in its borrowing costs. With a currency swap, it can borrow yen at preferred rates in Japan, transform the liability into US dollars to finance its U.S. operations, and obtain the forward cover necessary to service its yen debt. The requsite swap contract would provide for the delivery of forward U.S. dollars (which come from the U.S. operations) against yen. Such a contract would give the highly levered Japanese firm a fully hedged financing cost considerably below that which is available directly in US dollars.

A further illustration of the benefits of variations on this type of arrangement is provided by the transaction between a French car company, Renault, and a Japanese security house, Yamaichi. The swap was arranged by Bankers Trust Company, which also acted as intermediating principal to the counter-parties, in July 1981. Yamaichi was acting as principal for a number of Japanese institutional investors. At that time, Renault was unable (for regulatory reasons) to borrow fixed-rate yen finance. So Renault raised floating-rate US dollar debt and Yamaichi purchased dollar-denominated floating-rate notes with identical rate-setting dates for Japanese investors. As a result,

Renault was able to simulate a fixed-rate yen borrowing. Japanese investors were able to include foreign assets (dollar Floating Rate Notes) in their portfolios and, at the same time, hedge their dollar investment back into yen. The yield received was higher than that available on other yen fixed-rate investments.

3.3.2 Cross Currency Fixed to Fixed Debt Swap

This is very similar to the cross currency floating to fixed debt swap. The main difference is that all interest payments are fixed-rate. This type of swap was given much publicity by the transaction between IBM and the World Bank. Complete particulars of this transaction are not available. The basic elements are depicted in Figure 3.2.

Some years ago IBM needed to raise substantial funds. The amount required was too large for the U.S. capital market alone. So IBM raised large amounts in the Deutschemark and Swiss franc capital markets. These loans were converted into dollars and remitted back to the head office.

Some time later, the World Bank tried to raise funds in currencies with low interest rates, such as the Swiss franc, Deutschemark and yen. The amounts required were then too large for these markets to support.

The difficulty was resolved by two World Bank issues of dollar fixed-rate Eurobonds with maturities exactly matching IBM's existing Swiss franc and Deutschemark debt. Under a currency swap agreement, IBM would pay all the future interest and principal payments on the World Bank's dollar Eurobonds. In return the World Bank would pay all the future interest and principal payments on IBM's Swiss and Deutschemark debt.

The transaction was made possible because the dollar appreciated substantially against the Swiss franc and Deutschemark from the time IBM

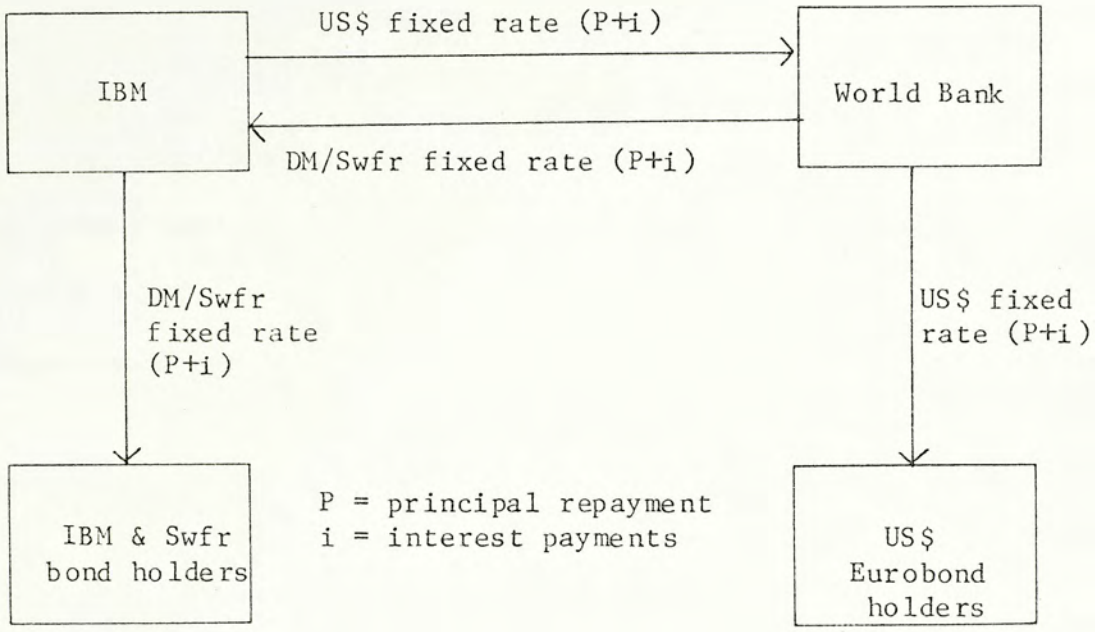


Figure 3.2 Cross Currency Fixed to Fixed Debt Swap

borrowed these currencies to the time it entered into the swap transaction with the World Bank. IBM was then able to lock in a foreign exchange profit by converting the foreign liabilities into simulated dollar liabilities. For the holders of the Deutschemarks, the cost of financing was reduced from 10% to 8.15%, when the rate on U.S. government term borrowing was 15%. The World Bank was also able to convert a dollar 16% fixed-rate liability into a simulated fixed-rate Deutschemark liability at a cost of approximately 10.13%.

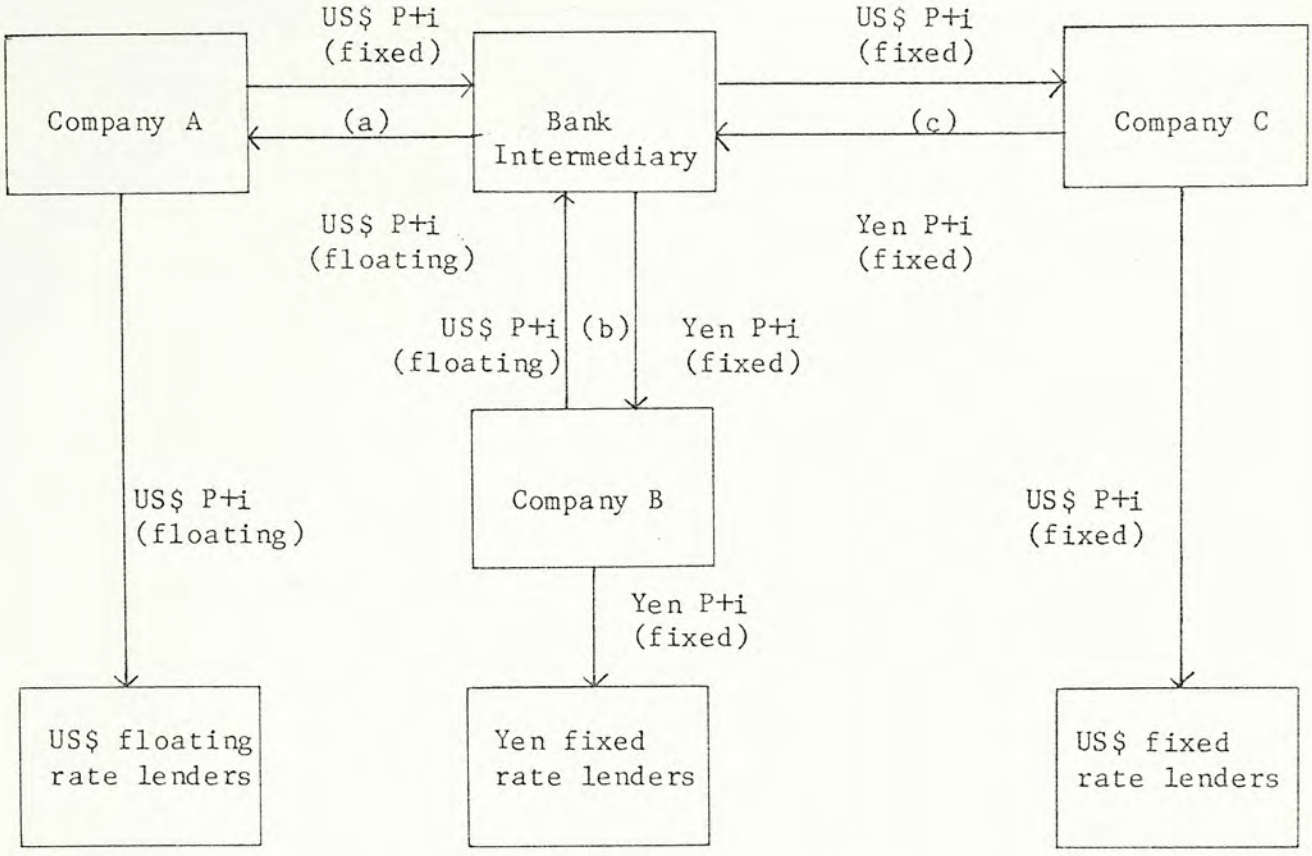
3.3.3 The Cocktail Swap

This category of swaps is discussed to show that there is no boundary to currency swaps. In essence, it combines the features of interest rate swap and the two types of cross currency swaps into one integrated operation. While a bank intermediary is usually necessary for most swaps, it is almost always a prerequisite for the cocktails. It is known that some of these transactions have been arranged, but particulars have not been made public.

The basic ingredients are shown in Figure 3.3. The bank intermediary's role, as principal, is to write all the swap contracts. Companies A, B and C may not know one another's identity. As far as Company A is concerned, it is involved in an interest rate swap. Typically, it is a less creditworthy borrower. Floating-rate dollars are borrowed in exchange for a fixed-rate dollar liability.

Company B is a strong borrower in the yen capital market but not so in the dollar market. Fixed-rate yen are borrowed in exchange for a floating-rate (below market) dollar liability via a cross currency fixed to floating debt swap.

Company C is a strong borrower in the dollar capital market but not so in the yen market. Fixed-rate dollars are borrowed in exchange



(a) Interest rate swap
(b) Cross currency fixed to floating debt swap
(c) Cross currency fixed to fixed debt swap

Figure 3.3 The Cocktail Swap

for a fixed-rate yen liability via a cross currency fixed to fixed debt swap.

3.4 The Philanthropic Nature

In theory a currency swap transaction will benefit all participants.

1. The Counter-parties

The greatest incentive for a company to take part in currency swap is the preference for a particular type of debt. For example, it might want to get into floating Libor instead of fixed rate yen. Another major motive is to get out of uncomfortable terms and reap financing advantages. Opportunities are open to corporate treasurers to:

- Arbitrage capital markets to achieve a cheaper all-in cost than by borrowing the currency directly.
- Cover long-term commitments in foreign currencies.
- Take advantage of subsidized government financing while eliminating currency exposure.
- Generate foreign assets by buying domestic securities.
- Write lease contracts on a hedged basis.
- Reap tax advantages.

As a result, many treasurers of big corporations now consider currency swaps as one of their normal fund-raising options.

2. The Arranger

The Arranger originates the swap, makes proposals to potential counter-parties, gives advice in negotiations and charges an arrangement fee for its services. Flat fees of between 1/4 and 1/2% of the amount raised for each party are common. Investment banks are superior in this

aspect because they are more competitive than commercial banks in the major bond markets.

3. The Intermediary Bank

Companies seldom swap with one another unless there is a bank in the middle to take care of the credit risk. The intermediary bank charges a fee for guaranteeing that one or both sides of the swap transaction will continue payments until the debts mature. Normal fees vary between 1/8 and 1/4% a year, depending on the company's credit standing. In addition, there is often a small front-end fee. Commercial banks can outperform investment banks in this aspect because of their higher capitalization. In other words, a big commercial bank may feel able to "take a position" if there are mismatches in the swap amounts among counter-parties.

CHAPTER IV

PRICING OF CURRENCY SWAPS

In many cases, the intermediary bank has to offer long-date forward contracts to the parties in a currency swaps. Therefore, it must price the long-date forward contracts in addition to setting the front-end fee, hedging fee and commission in the deal. The pricing of the long-date forward contracts will be analyzed first and then the determination of the fees will be discussed.

4.1 Pricing of the Long-date Forward Contracts

4.1.1 The Role of the Long-date Forward Contracts in Currency Swaps

Though capital markets arbitrage is the major motive in the initiation of currency swaps, parties in the deal may also look for foreign exchange exposure and interest rate exposure coverage. If a party enters a currency swap solely to seek arbitrage between markets, it will surely need long-date forward contracts for the interest payments and principal repayments. If the party also achieves a foreign exchange exposure coverage in the currency swap, it probably does not need the intermediating bank's long-date forward contracts. Examples of the above cases are given below.

1. Currency swaps which do not need long-date forward contracts

If a party covers a foreign exchange exposure in a currency swap, it will not need forward contracts for future payments since the swap is a hedge already. An example is that: a investor wants to invest in Japan (either in portfolio investment or long-term investment), but it can only raise US dollar funds. This may be because of the unavailability of Yen funds under the Japanese government's regulation, or the Yen funds will be too costly. So, it tries to enter a currency

swap with a US lessee which locks in a low-cost Yen-denominated lease. In this deal, the investor obtains low-cost Yen funds and hedges its Yen revenue. At the same time, the U.S. lessee also obtains a favorable rate in dollar borrowing, which it cannot get with its own credit rating, and also eliminates its foreign exchange exposure in Yen liabilities. Therefore, no forward contract is needed by the parties in this case. They just have the currencies which they need to pay to one another. The future payments are illustrated in the following diagram.

Future Interest Payments and Principal Repayments

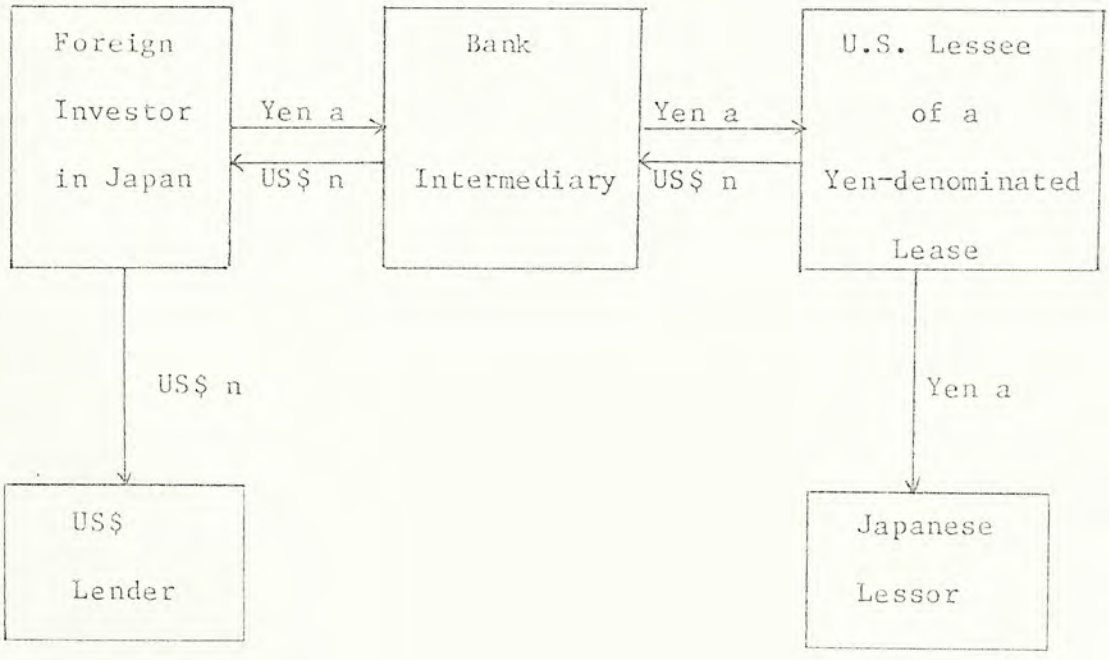


Figure 4.1 Currency Swap which Does Not Need a Long-date Forward Contract

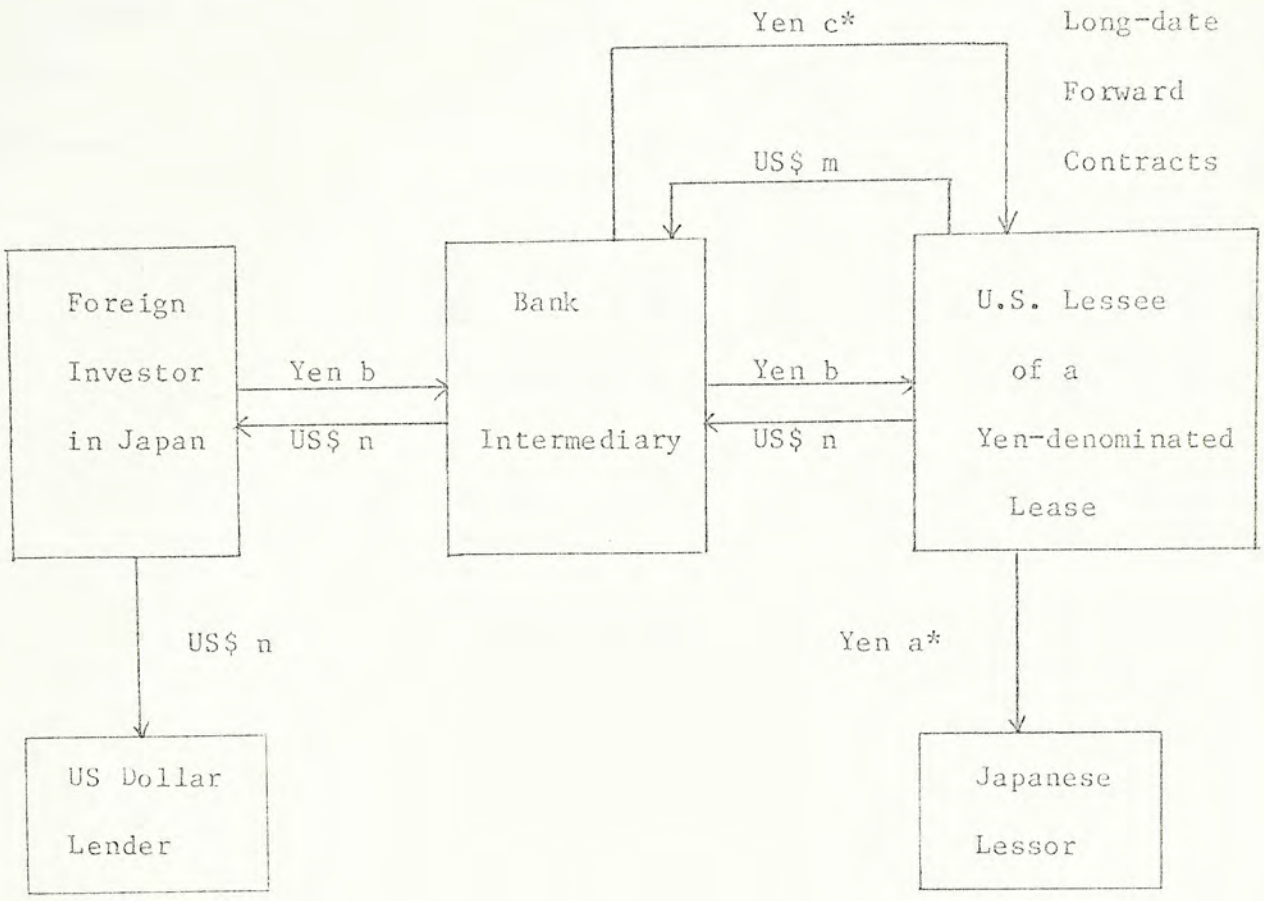
2. Currency swaps which need long-date forward contracts

i. One party subsidizes the counter-party's payments

It is common in currency swaps that one party subsidizes the counter-party's interest payments. The reason behind this is the creditworthiness of one party is much higher than that of the other. The motive of the party with higher creditworthiness in entering the currency swap is, in fact, to get a subsidy for its interest payments. In this case, the arbitrage between the capital markets is obtained through the high credit-rating of one party and the subsidy of the counter-party.

An example is given by extending the example in Figure 4.1. In this case, the U.S. lessee subsidizes the investor in the Yen interest payments. Therefore, the investor's cost of funds is lowered and long-date forward contracts are sold to the lessee by the intermediating bank. The transactions in the future interest payments and principal repayments are illustrated in the following diagram.

Future Interest Payments and Principal Repayments



*Yen a = Yen b+Yen c; and Yen c is the subsidy

Figure 4.2 Currency Swap in Which Long-date Forward Contracts are Needed for Making up the Subsidy

In fact, the "Foreign Investor" in Figure 4.2 can be substituted by a large Japanese corporation which has high credit-rating in the Euromarket. In this case, the Japanese corporation wants to obtain Yen at a very low cost by getting the counter-party's subsidy. A representative example of such a corporation is Japan Air Line (JAL). Through currency swaps, JAL can borrow Yen funds more cheaply than the Japanese government.[1]

However, not all subsidizing parties need long-date forward contracts in the above manner. If the "U.S. lessee" is replaced by a "small Japanese corporation" which needs low cost US follar funds. The long-date forward contracts are needed by the Japanese corporation for paying interest and repaying the principal of the dollar liabilities rather than making up the subsidy. The transactions are illustrated in the following diagram.

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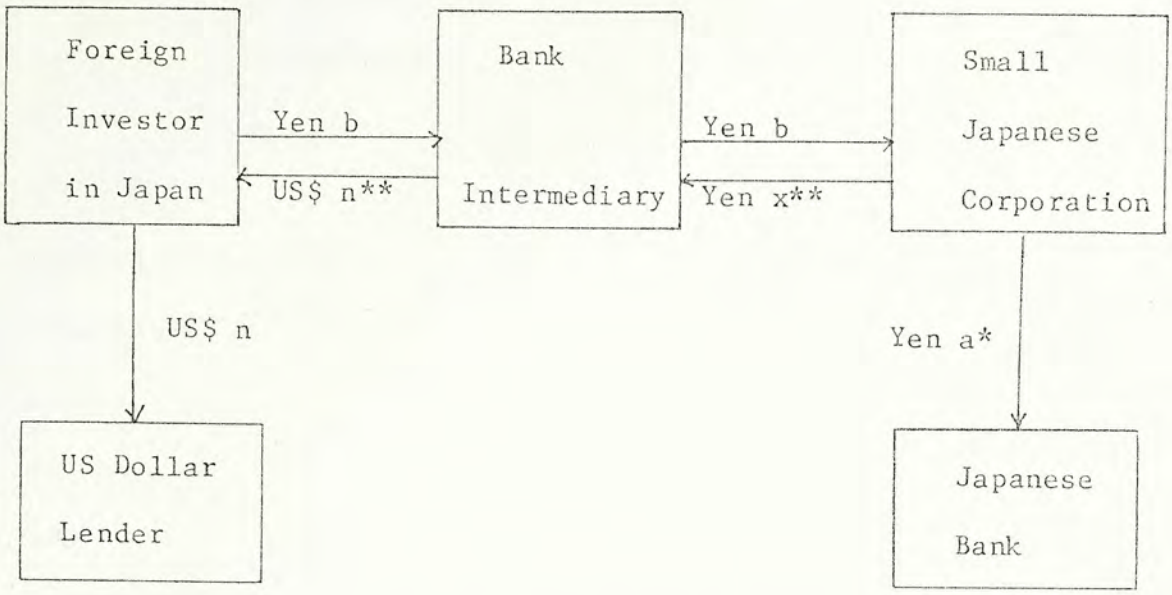
[1] Curtin, Donal. "Deals That Made The Record Books", Euromoney, September 1983, P.109.

Future Interest Payments and Principal Repayments



**Long-date Forward Contracts where

US$ n = Yen x

*Yen a > Yen b, the difference is made up by the Japanese corporation's subsidy.

Figure 4.3 Currency Swap in which Long-date Forward Contracts are Needed for Interest Payments and Principal Repayments.

ii. Pure arbitrage between capital markets

If a party's motive in entering a currency swap is pure arbitrage between capital markets, it will need long-date forward contracts for future interest payments and principal repayments. A representing example is the dual-currency swap arranged by Morgan Grenfell for General Motors Acceptance Corporation (GMAC)[1]. This dual-currency swap brought GMAC, a triple-A US corporation, to the Swiss franc public bond market. However, all the repayment obligations were swapped into dollars. In this case, GMAC could pay about one and one quarter percent below what it had to pay in the US bond market. The full mechanism of the hedge inside such long-date forward contracts is still not yet known and it is Morgan Grenfell's secret weapon. Nevertheless, the basic transactions can be shown in the following diagram.

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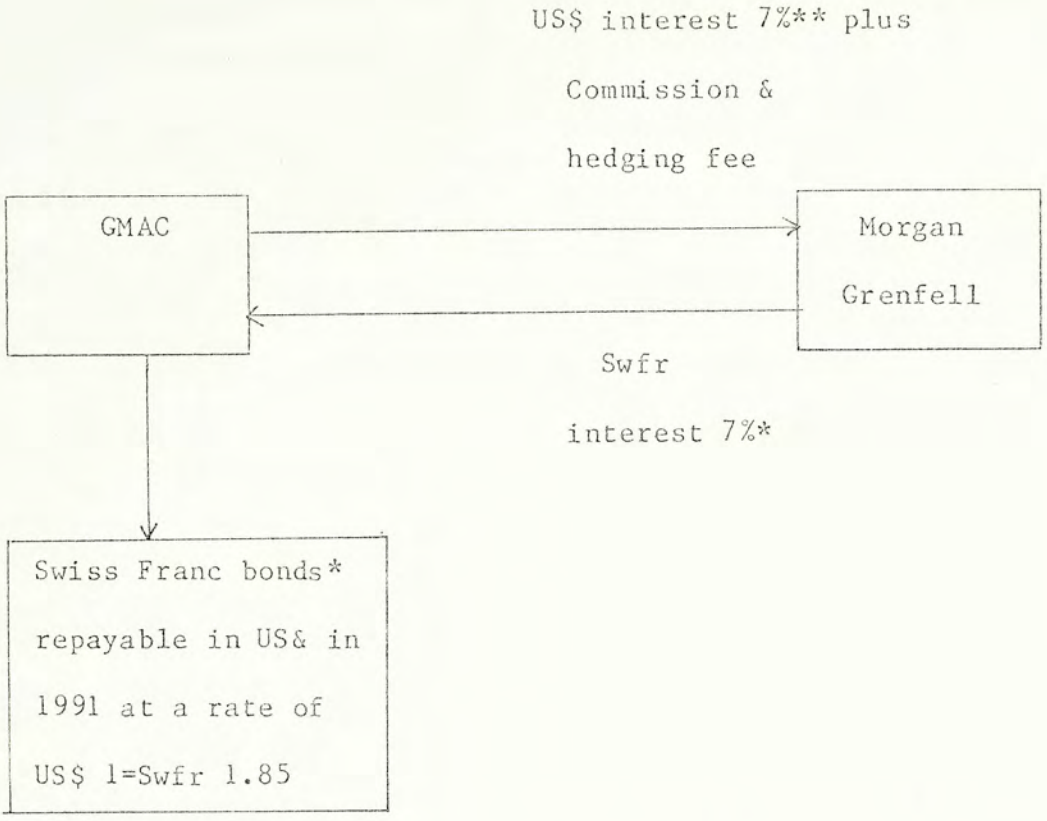
[1] "The Way into Any Market", Euromoney, November, 1983, P.68.



**Long-date Forward Contracts

*The bonds were issued in October 1983, when the rate was, US$ 1=Swfr 2.1

Figure 4.4 The First Fully-hedged Dual-currency Swaps

4.1.2. Exposure in the Long-date Forward Contracts

When the intermediating bank sells long-date forward contracts to its client, it takes up a foreign exchange exposure. Therefore, it must hedge against this exposure. The approaches to hedge and price the long-date forward contracts will be discussed in section 4.1.3. In this section, the exposure in the forward contracts is analyzed first.

1. Foreign exchange exposure in long-date forward contracts

When a bank sells long-date forward contracts to a client, it promises to deliver a currency to the client in the future in exchange for another currency at an agreed rate. However, the agreed forward rate may deviate very much from the spot rate on the future delivery day. Therefore, this is a foreign exchange exposure which will cause a foreign exchange gain or loss to the bank. As a result, the bank must hedge against this expsoure in order to arrive at a justified forward price (rate) for a long-date forward contracts.

2 The amount of exposure in a long-date forward contract

The amount of foreign exchange exposure in a long-date forward contract is the amount which is influenced by the fluctuation in exchange rate. The calculation is illustrated by the following example.

Example

Bank A sells long-date forward contracts to Company X as follows:

Year	Bank A will deliver to Company X	Bank A will receive from Company X	Forward Rates
	Yen billion	US$ million	Yen/US$
1	0.22	1.00	220
2	0.22	1.00	220
3	0.22	1.00	220
4	0.22	1.00	220
5	0.22	1.00	220
6	0.22	1.00	220
7	0.22	1.00	220
8	2.20	10.00	220

If Bank A determines the forward rates only by forcasting, all the future payments will be subject to foreign exchange gain on loss due to the fluctuation of the future spot rates. If no hedging is done, the exposure in the future years will be the full amount of the Yen payments. They are show as follows:

Year	Exposure (Yen billion)
1	0.22
2	0.22
3	0.22
4	0.22
5	0.22
6	0.22
7	2.42

The foreign exchange gain or loss in the future years can be calculated as follows[1]:

Exposure	X	Percentage exchange rate change	=	Foreign exchange gain or loss

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[1] McRae, T.W., and Walker, P.P. Foreign Exchange Management, P.60 Prentice/Hall International, Inc., 1980.

4.1.3. Approaches for Pricing of the Long-date Forward Contracts

As shown in section 4.1.2., the intermediating bank must hedge against the forward contracts in order to avoid the foreign exchange exposure. The forward rates should be determined from the hedge rather than by forcasting. This determination of forward rates is also called the pricing of forward contracts. Different approaches for pricing the contracts will be discussed one by one in the following sections.

In the active short-term forward markets, the forward rates are determined under the interest rate parity theory. Therefore, before the pricing methods in long-term forward markets are analysed, the interest rate parity theory should be discussed first.

1. Interest rate parity theory for short-term forward markets

This theory states that arbitage between money markets will make the forward exchange rate stay at "interest rate parity", that is, the interest rate differential is equal to forward rate discount or premium. Mathematical presentation of the concept is shown as follows:

Covered arbitrage margin (CAM):

The interest advantage of investment in one currency over that in another.

$$CAM = \frac{i_x - i_y}{1 + i_y} - \frac{FR - R}{R}$$

where i_x : interest rate on currency x

i_y : interest rate on currency y

FR : Forward price (rate) of currency y in terms of currency x (i.e. currency x/currency y)

R : Spot price (rate) of currency y in terms of currency x (i.e. currency x/currency y)

$\frac{i_x - i_y}{1 + i_y}$ is the percentage interest rate differential (with reference to proceeds from investment in currency y)

$\frac{FR - R}{R}$ is the percentage forward rate premium or discount (with reference to spot rate of currency y)

The interest rate parity theory states that arbitrage will make CAM equal zero. The forward rate at this point is called "parity forward rate" (FR*). Putting this into mathematical terms will be:

$$\frac{i_x - i_y}{1 + i_y} - \frac{FR^* - R}{R} = 0$$

$$\frac{i_x \quad i_y}{1 + i_y} = \frac{FR^* - R}{R}$$

$$FR^* = \left[\frac{i_x - i_y}{1 - i_y} + 1\right] R \quad \text{------ (1)}$$

i. In the short-term markets, the forward rates are, in fact, parity forward rates determined by equation (1).

An example of this pricing method is given as follows:

One-year interest rate:

US$	10%
Yen	8%

Spot rate (Yen/US$): 220

One-year forward rate (Yen/US$) : $\left[\frac{0.08 - 0.10}{1 + 0.10} + 1\right] 220$

$= 216$

ii. The above calculation can also be viewed as the result of hedging against a one-year forward contract. An example of selling a one-year US$-Yen forward contract is given to illustrate the hedging mechansim. To hedge the exposure, an amount of US$ M is invested in one-year assets and an equivalent amount of Yen is borrowed for one year. When the forward contract matures, the bank's dollar assets will generate the needed amount (US$ x) for the promised delivery and the client's Yen payment will be used to pay the Yen liabilities. This hedging mechanism is shown in the following table:

	US Dollar investment	Yen borrowing	Exchange rate (Yen/US$)
Year 0	M	220M	220
	at 10% ↓	at 8% ↓	
Year 1	1.1M	237.6M	216
	(1.1M=x)		(237.6/1.1=216)

Table 4.1 Parity Forward Rate for Short-term Forward Contract

2. Parity Forward-rates Method for Single-payment, Multi-period Forward Contracts

Single-payment, multi-period forward contracts refer to forward contracts which demand the delivery of a currency in one payment several years from now.

The most commonly used method for pricing this kind of long-date forward contract is extended from the interest rate parity theory. However, its assumptions should be subject to careful analysis.

This pricing method sets the forward rate at "interest rate parity" at the maturity date of the forward contract. In another word, the forward rate will make the return on investments from both currencies "equal" one another. However, this method assumes the interest differential between the currencies remains the same throughtout the exposure periods. An example of calculations based on this method is given below.

Example : Parity forward rate method

Bank A sells a 7-year forward contract promising it will exchange US$ x for the client's Yen after seven years. The common pricing method assumes the hedge of this forward contract as follows:

	US Dollar investment	Yen borrowing	Exchange rate (Yen/US$)
Year 0	M	220M	220
	7-year rate at 10% ↓ $x(1.10)^7$	7-year rate at 8% ↓ $x(1.08)^7$	
Year 7	1.949M	377.04M	193.48
	(1.949M=x)		(377.04/1.949=193.48)

Table 4.2 Parity Forward Rate Method for Single-payment, Multi-period Forward Contract

If the above forward rate is calculated by extending equation (1), the calculation is as follows:

$$FR^* = \left[\frac{(1.08)^7 - (1.10)^7}{(1.10)^7} + 1\right] 220$$

$$= \left[\frac{1.714 - 1.949}{1.949} + 1\right] 220$$

$$= 193.48$$

The above calculation basically assumes that the interest gained from the dollar investment can be reinvested at 10% and the interest paid for the Yen borrowing can be rolled over at 8%. Obviously, this assumption is not very realistic as interest rates fluctuate very much. Therefore, this method is, in fact, not very suitable for pricing long-date forward contracts.

3. Average Forward-rate Method for Pricing Multi-payment, Multi-period Forward Contracts

This is a commonly used pricing method. However, it also tries to set the forward rates at "interest rate parity" by assuming that the interest rate remains unchanged over the exposure periods.

Besides, this method assumes the bank will hedge the forward contract with an "average" interest rate differential. This "average" interest rate differential is the differential for the longest period of the contract. Obviously, the interest rate differential for the periods in between can deviate from this "average-rate" considerably. However, when this method is used in pure mathematical calculation, this

erroneous assumption cannot be easily seen. An example of this method is given below.

Example: Average forward-rate method

Bank A sells a 7-year forward contract promising it will deliver US$ X annually over the coming seven years in exchange for the client's Yen. By extending equation (1), this method calculate the forward rates as follows:

7-year interest rate:

US dollar investment	10%
Yen borrowing	8%
Spot rate (Yen/US$):	220

at year n, the forward rate FRn is calcualted by the equation:

$$FRn = \left[\frac{(1.08)^n - (1.10)^n}{(1.10)^n} + 1 \right] 220$$

Therefore, the forward rate in the coming years are:

Year (n)	Forward rates (Yen/US$)	Yen Premium (% per year)
0	FR_0 = 220.00	+1.818
1	FR_1 = 216.00	+1.818
2	FR_2 = 212.07	+1.818
3	FR_3 = 208.22	+1.818
4	FR_4 = 204.43	+1.818
5	FR_5 = 200.71	+1.818
6	FR_6 = 197.06	+1.818
7	FR_7 = 193.48	+1.818

Table 4.3 Average-rate Method for Multi-payment, Multi-period Forward Contract

Since this method also assumes that the interest rate differential will remain unchanged, the forward rate at the seventh year (193.48) is the same as that in Table 4.2.

4. Current-yield Curve Method for Pricing Multi-payment, Multi-period Forward Contracts

The current-yield curve method takes a more accurate view than the average-rate method in section 3. This method takes into account of the current-yield curve of the entire exposure period. In another word, the current-yield (interest rates) for different periods in the future are considered. However, the name "current-yield curve" implies that only the yield curve for the present moment is considered. This means that the interest of the investments and liabilities is assumed to be reinvested and rolled over at the current-yield curve. Therefore, this pricing method still carries the weak assumption which exists in the

methods described in section 2 and 3. Nevertheless, these methods are still adopted by many people in the market. An example of this pricing method is given below.

Example: Current yield-curve method

Bank A sells a 7-year forward contract promising it will deliver US$ X annually over the coming seven years in exchange for the client's Yen. By extending equation (1) and substituting the interest rates with the current-yield, the forward rates are found as follows:

Maturity Year	Current-yield (%)		Forward Rate*
(n)	US$	Yen	(Yen/US$)
0	--	--	Spot rates = 220.00
1	10.0	8.0	FR_1 = 216.00
2	10.5	8.1	FR_2 = 210.55
3	11.0	8.4	FR_3 = 204.90
4	10.6	8.2	FR_4 = 201.52
5	10.1	8.0	FR_5 = 199.80
6	9.8	7.9	FR_6 = 198.12
7	10.0	8.0	FR_7 = 193.48

* $$FR_n = \left[\frac{(1 + i_{¥})^n - (1 + i_{\$})^n}{(1 + i_{\$})^n} + 1 \right] 220$$

where $i_{¥}$: current-yield of Yen of maturity year n.

$i_{\$}$: current-yield of US dollar of maturity year n.

Table 4.4 Current-yield Curve Method for Multi-payment, Multi-period Forward Contract

As indicated by the formula for calculating the forward rates, this pricing mehtod assumes that the interest differential for each maturity year between the two currencies will remain unchanged over time. In fact, this assumption is also the basic weakness of the above method.

5. Exchange of Borrowings Method for Pricing Multi-payment, Multi-period Forward Contracts

This method is a fully hedged method for pricing forward contracts. However, this method can be used only when there is an agreement to exchange the interest payments and principal repayments of borrowing in two different currencies.

If two parties in a currency swap agree to exchange their borrowings without one party subsidizing the other (Figure 4.1), this method can be used to price the forward contracts between the two parties. In this case, the intermediating bank only acts as the guarantee for the parties' execution of the contracts. An example of this pricing method is given below.

Example: Exchange of borrowings method

Two parties enter a currency swap. They exchange their US dollar and Yen 7-year borrowings. The cash inflow (outflow) of the borrowings is shown as follows:

Year	US dollar (at 10%)	Yen (at 8%)	Exchange rate (Yen/US$)
0	X	220X	220 (spot rate)
1	(0.1X)	(17.6X)	176
2	(0.1X)	(17.6X)	176
3	(0.1X)	(17.6X)	176
4	(0.1X)	(17.6X)	176
5	(0.1X)	(17.6X)	176
6	(0.1X)	(17.6X)	176
7	(1.1X)	(237.6X)	216

Table 4.5 Exchange of Borrowings Method for Multi-payment, Multi-period Forward Contract

Unless one of the parties defaults, there is no foreign exchange exposure for the bank in guaranteeing the forward contracts. Therefore, the default risk rather than foreign exchange risk is the concern in this kind of forward contract. In fact, the default loss is the foreign exchange loss, if there is any.

6. Fully Arbitraged Cash-flow-based Method for Pricing Mutli-payment, Multi-period Forward Contracts

This method provides an access to price forward contracts on a fully hedged basis. The exposure is fully hedged by exact matching of

the cash inflow and outflow of the forward contracts. The matching includes both of the amount of cash flow and the maturity days of the hedge. Therefore, all the foreign exchange exposure and interest rate exposure are covered. That means, all uncertainty is eliminated.

Though mismatch in maturity days may exist in the practical world, this section will discuss the matching of cash flow. Handling of mismatch in maturity days will be discussed in the summary of this chapter. An example of this pricing method is given below.

Example: Fully arbitraged cash-flow-based method

Bank A sells a 7-year forward contract promising it will deliver US$ X annually over the coming seven years in exchange for the client's Yen. The forward contract is priced by the hedge as follows:

i. The US$ X payments for the coming seven years will be generated by the following investment in US dollars:

Table 4.6 Investment Side of the Fully Arbitrage Cash-flow-based Method

		U.S. dollar Investment (Years of maturity)						
Year	Total US$ Cash flow	1 Year at10.0%	2 Year at10.5%	3 Year at11.0%	4 Year at10.6%	5 Year at10.1%	6 Year at9.8%	7 Year at10.0%
0	(A^*)	(A_1)	(A_2)	(A_3)	(A_4)	(A_5)	(A_6)	(A_7)
1	X	A_2*	C_2	C_3	C_4	C_5	C_6	C_7
2	X		A_3*	C_3	C_4	C_5	C_6	C_7
3	X			A_4*	C_4	C_5	C_6	C_7
4	X				A_5*	C_5	C_6	C_7
5	X					A_6*	C_6	C_7
6	X						A_7*	C_7
7	X							X*

Where As are amounts of US$ assets and Cs are amounts of coupon (interest) payments.

* Year 7 $X = A_7 + C_7 \Rightarrow X = A_7 + 0.10X \Rightarrow A_7 = X/1.10$
(asset value plus coupon)

Year 6 $A_7 = A_6 + C_6 \Rightarrow A_7 = A_6 + 0.098A_6 \Rightarrow A_6 = A_7/1.098$
(asset value plus coupon)
and $A_7 + C_7 = X$ (total cash generated)

Year 5 $A_6 = A_5 + C_5 \Rightarrow A_6 = A_5 + 0.101A_5 \Rightarrow A_5 = A_6/1.101$
(asset value plusn coupon)
and $A_6 + C_6 + C_7 = A_7 + C_7 = X$ (total cash generated)

Year 4 $A_5 = A_4 + C_4 \Rightarrow A_5 = A_4 + 0.106A_4 \Rightarrow A_4 = A_5/1.106$
and $A_5 + C_5 + C_6 + C_7 = A_6 + C_6 + C_7 = X$(total cash generated)

Year 3 $A_4 = A_3 + C_3 \Rightarrow A_4 = A_3 + 0.11A_3 \Rightarrow A_3 = A_4/1.11$
and $A_4 + C_4 + C_5 + C_6 + C_7 = A_5 + C_5 + C_6 + C_7 = X$
(total cash generated)

Year 2 $A_3 = A_2 + C_2 \Rightarrow A_3 = A_2 + 0.105A_2 \Rightarrow A_2 = A_3/1.105$
and $A_3 + C_3 + C_4 + C_5 + C_6 + C_7 = A_4 + C_4 + C_5 + C_6 + C_7 = X$ (total cash generated)

Year 1 $A_2 = 1.10A_1 \Rightarrow A_1 = A_2/1.10$
and $A_2 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 = A_3 + C_3 + C_4 + C_5 + C_6 + C_7 = X$ (total cash generated)

Year 0 $A = A_1 + A_2 + A_3 + A_4 + A_5 + A_6 + A_7$

If all the As in Table 4.6 are expressed in terms of X, they will be as follows:

$A_7 = X/1.10 = 0.909X$

$A_6 = X/(1.10)(1.098) = 0.828X$

$A_5 = X/(1.10)(1.098)(1.101) = 0.752X$

$A_4 = X/(1.10)(1.098)(1.101)(1.106) = 0.680X$

$A_3 = X/(1.10)(1.098)(1.101)(1.106)(1.11) = 0.613X$

$A_2 = X/(1.10)(1.098)(1.101)(1.106)(1.11)(1.105) = 0.554X$

$A_1 = X/(1.10)(1.098)(1.101)(1.106)(1.11)(1.105)(1.10) = 0.504X$

The total investment (total assets) A is

$$A = A_7 + A_6 + A_5 + A_4 + A_3 + A_2 + A_1 = 4.840X$$

ii. The liabilities side of the hedge is shown as follows:

The first variable to be maintained by the bank is the proportion of the liabilites distributed over the seven year period. Besides providing a complete hedge of the exposure, this pricing method also allows the bank to manipulate the forward rates by varying the proportion of liabilities. The mechanism of manipulating the forward rates is shown in the two examples which follow:

Case 1 The distribution of debt proportion is the same as the distribution of investment proportion.

From the above calculation:

$$A = 4.840X$$

Year	Investment	Proportion in total investment
7	A_7	0.909/4.840 = 0.188
6	A_6	0.828/4.840 = 0.171
5	A_5	0.752/4.840 = 0.155
4	A_4	0.680/4.840 = 0.141
3	A_3	0.613/4.840 = 0.127
2	A_2	0.554/4.840 = 0.114
1	A_1	0.504/4.840 = 0.104

Table 4.7 Distribution of the Investment Proportion in Table 4.6

Table 4.8 Liabilities Side of the Fully Arbitrage Cash-flow-based Method

		Yen Borrowing (years of maturity)						
Year	Total Yen Cash flow	1 Year at 8.0%	2 Year at 8.1%	3 Year at 8.4%	4 Year at 8.2%	5 Year at 8.0%	6 Year at 7.9%	7 Year at 8.0%
0	D	D_1	D_2	D_3	D_4	D_5	D_6	D_7
1	(P_1)	(D_1+i_1)	(i_2)	(i_3)	(i_4)	(i_5)	(i_6)	(i_7)
2	(P_2)		(D_2+i_2)	(i_3)	(i_4)	(i_5)	(i_6)	(i_7)
3	(P_3)			(D_3+i_3)	(i_4)	(i_5)	(i_6)	(i_7)
4	(P_4)				(D_4+i_4)	(i_5)	(i_6)	(i_7)
5	(P_5)					(D_5+i_5)	(i_6)	(i_7)
6	(P_6)						(D_6+i_6)	(i_7)
7	(P_7)							(D_7+i_7)

D_s are debts, "i's are interest payments and P_s are total payments of the years.
Therefore:

$$P_1 = D_1 + i_1 + i_2 + i_3 + i_4 + i_5 + i_6 + i_7$$

$$P_2 = D_2 + i_2 + i_3 + i_4 + i_5 + i_6 + i_7$$

$$P_3 = D_3 + i_3 + i_4 + i_5 + i_6 + i_7$$

$$P_4 = D_4 + i_4 + i_5 + i_6 + i_7$$

$$P_5 = D_5 + i_5 + i_6 + i_7$$

$$P_6 = D_6 + i_6 + i_7$$

$$P_7 = D_7 + i_7$$

The total amount of Yen debt, D, is:

$$D = D_1 + D_2 + D_3 + D_4 + D_5 + D_6 + D_7$$

and $D = 220A$, where US$ 1 = Yen 220 is the spot rate;

and A is total US dollar investment (assets), from Table 4.6

In this case, the debt proportion in Table 4.8 equals the investment proportion in Table 4.6. If the liabilities are expressed in terms of the Bank's annual U.S. dollar payment, they are:

Maturity Year	Yen liabilites	Expressed in terms of total debt D*	Exposured in terms of X
7	D_7	0.188D	220 A **= (220)(0.909)x = 200X
6	D_6	0.171D	220A = (220)(0.828)X = 182X
5	D_5	0.155D	220A = (220)(0.752)X = 165X
4	D_4	0.141D	220A = (220)(0.680)X = 150X
3	D_3	0.127D	220A = (220)(0.613)X = 135X
2	D_2	0.114D	220A = (220)(0.554)X = 122X
1	D_1	0.104D	220A = (220)(0.504)X = 111X

* : From Table 4.7
** : From Table 4.7 or P.44
\+ : Spot exchange rate is US $1 = Yen 220

Table 4.9 Yen Liabilities Expressed in Terms of the Bank's Annual US Dollar Payment (X)

If the interest payments are expressed in terms of X , they will be as follows:

Maturity Year	Interest payments	Interest payments expressed in terms of X
7	i_7	$0.08*D_7$** = (0.08)(200X) = 16X
6	i_6	$0.079D_6$ = (0.079)(182X) = 14.4X
5	i_5	$0.08D_5$ = (0.08)(165X) = 13.2X
4	i_4	$0.082D_4$ = (0.082)(150X) = 12.3X
3	i_3	$0.084D_3$ = (0.084)(135X) = 11.3X
2	i_2	$0.081D_2$ = (0.081)(122X) = 9.9X
1	i_1	$0.08D_1$ = (0.08)(111X) = 8.9X

*Interest rate of the maturity year, from Table 4.8

**From Table 4.9

Table 4.10 Interest Payments Expressed in Terms of the Bank's Annual US Dollar Payment (X)

The total payments for the years are:

Maturity year	Total payments*	Total payments expressed in terms of X**
7	P_7	200X + 16X = 216X
6	P_6	182X + 14.4X + 16X = 212.4X
5	P_5	165X + 13.2X + 14.4X + 16X = 208.6X
4	P_4	150X + 12.3X + 13.2X + 14.4X + 16X = 205.9X
3	P_3	135X + 11.3X + 12.3X = 13.2X + 14.4X + 16X = 202.2X
2	P_2	122X + 9.9X + 11.3X + 12.3X + 13.2X + 14.4X + 16X = 199.1X
1	P_1	111X + 8.9X + 9.9X + 11.3X +12.3X + 13.2X + 14.4X + 16X = 197X

* From Table 4.8

** From Table 4.9 and Table 4.10

Table 4.11 Total Annual Yen Payments Expressed in Terms of the Bank's Annual US Dollar Payments (X)

Therefore, the forward rates are:

Year	Forward rates (Yen/US$)				
1	P_1 / X	=	197X / X	=	197.0
2	P_2 / X	=	199.1X / X	=	199.1
3	P_3 / X	=	202.2X / X	=	202.2
4	P_4 / X	=	205.9X / X	=	205.9
5	P_5 / X	=	208.6X / X	=	208.6
6	P_6 / X	=	212.4X / X	=	212.4
7	P_7 / X	=	216X / X	=	216.0

Table 4.12 Forward Rates For the Contract

Case 2: The distribution of debt proportion is different from the distribution of investment proportion.

The fully arbitraged cash-flow-based pricing method also allows the Bank to receive the Yen in specific proportion demanded by the client. Suppose the client wishes to pay its Yen in the following proportions:

Maturity Year	Proportion of the Total Yen liabilities	Expressed in terms of total Yen debt, D
1	1%	0.01D
2	5%	0.05D
3	9%	0.09D
4	10%	0.1D
5	15%	0.15D
6	20%	0.2D
7	40%	0.4D

Table 4.13 Client's Specification on Proportion of Yen Payments

The Bank can easily adapt to the client's demand by imposing the above proportions on the Yen borrowing in the hedge. Then the Yen liabilities, which mature in the coming years, will be exactly covered by the client's payments. If the Yen principal and interest payments are expressed in terms of the Bank's annual US dollar payment (X), they will be as follows:

Maturity Year	Yen debt	Yen debt expressed in terms of X
1	D_1	0.01D* = (0.01)(220A)** = 2.2(4.84X)† = 10.6X
2	D_2	0.05D = (0.05)(220A) = 11(4.84X) = 53.3X
3	D_3	0.09D = (0.09)(220A) = 19.8(4.84X) = 95.8X
4	D_4	0.1D = (0.1)(220A) = 22(4.84X) = 106.5X
5	D_5	0.15D = (0.15)(220A) = 33(4.84X) = 159.7X
6	D_6	0.2D = (0.2)(220A) = 44(4.84X) = 213.0X
7	D_7	0.4D = (0.4)(220A) = 88(4.84X) = 425.9X

* From Table 4.13

** Spot rate : US$1 = ¥220, therefore, D = 220A

† From P. 44, A = 4.84X

Table 4.14 Yen Liabilities Expressed In Terms of the Annual US Dollar Payments (X)

If the interest payments are also expressed in terms of X, they will be as follows:

Maturity Year	Yen Interest payments	Interest payments expressed in terms of X	
1	i_1	$0.08*D_1$** = 0.08(10.6X)	= 0.85X
2	i_2	$0.081D_2$ = 0.081(53.3X)	= 4.32X
3	i_3	$0.084D_3$ = 0.084(95.8X)	= 8.05X
4	i_4	$0.082D_4$ = 0.082(106.5X)	= 8.73X
5	i_5	$0.08D_5$ = 0.08(159.7X)	= 12.78X
6	i_6	$0.079D_6$ = 0.079(213.0X)	= 16.83X
7	i_7	$0.08D_7$ = 0.08(425.9X)	= 34.07X

* Yield of the maturity year, from Table 4.8

** From Table 4.14

Table 4.15 Yen Interest Payments Expressed in Terms of the Annual US Dollar Payments (X)

The total payments for the years are:

Maturity year	Total payments*	Total payments expressed in terms of X**
1	P_1	10.6X + 0.85X + 4.32X + 8.05X + 8.73X + 12.78X + 16.83X + 34.07X = 96.23X
2	P_2	53.3X + 4.32X + 8.05X + 8.73X + 12.78X + 16.83X + 34.07X = 138.08X
3	P_3	95.8X + 8.05X + 8.73X + 12.78X + 16.83X + 34.07X = 176.26X
4	P_4	106.5X + 8.73X + 12.78X + 16.83X + 34.07X = 178.91X
5	P_5	159.7X + 12.78X + 16.83X + 34.07X = 223.38X
6	P_6	213.0X + 16.83X + 34.07X = 263.9X
7	P_7	425.9X + 34.07X = 459.97X

* From Table 4.8
** From Table 4.14 and Table 4.15

Table 4.16 Total Annual Yen Payments Expressed in Terms of the Annual US Dollar Payments (X)

Therefore, the forward rates are:

Year	Forward rates (Yen/US$)
1	P_1*/X = 96.23
2	P_2 /X = 138.08
3	P_3 /X = 176.26
4	P_4 /X = 178.91
5	P_5 /X = 223.38
6	P_6 /X = 263.90
7	P_7 /X = 459.97

* From Table 4.16

Table 4.17 Forward Rates for the Contract

When Table 4.17 is compared with Table 4.12, great difference can be recognised between the two sets of forward rates. They are shown as follow:

Year	Forward rates from Table 4.12 (Yen/US$)	Forward rates from Table 4.17 (Yen/US$)
1	197.0	96.23
2	199.1	138.08
3	202.2	176.26
4	205.9	178.91
5	208.6	223.38
6	212.4	263.90
7	216.0	459.97

Table 4.18 Comparison of Forward Rates Generated From Two Different Hedges of a 7-year Forward Contract

As shown in the above title, the fully arbitraged cash-flow-based pricing method allows the intermediating bank to manipulate the prices of long-date forward contracts in meeting the clients' demand. Added to its fully hedged cash flow, this method offers the best and the most flexible approach to the Bank in pricing long-date forward contracts.

4.1.4 Summary of the Section

Section 4.1 begins with "role of the long-date forward contracts in currency swaps" (4.1.1). Then, "exposure in the long-date forward contracts" and "approaches for pricing of the long-date forward contracts" (4.1.3.) are discussed.

Section 4.1.1 explains why long-date forward contracts are needed by the parties in some kinds of currency swaps. Section 4.1.2 discusses

how foreign exchange exposure arises in the long-date forward contracts. Section 4.1.3 analyzes five methods for pricing long-date forward contracts.

Section 4.1.3 begins with a discussion on the interest rate parity theory, since this theory is the basis for pricing forward contracts in the short-term markets. Then three commonly used methods for pricing long-date forward contracts are discussed. These methods try to extend the interest rate parity theory to the long-term forward markets. However, all of these methods make a weak assumption that the reinvestment rate in the future will be the same as the current rate. That is, they assume that the interest rate differential between two currencies will remain unchanged over time.

After discussing these three methods, the "exchange of borrowings method" and the "fully arbitraged cash-flow-based method" are introduced. Under these two methods, the exposure in the long-date forward contracts is fully hedged. However, the latter has a much broader application than the former in pricing forward contracts. Besides, the latter one also allows the bank to manipulate the forward rates to meet the client's demand. The core of the hedge in the "fully arbitraged" method is presented in Table 4.6 and Table 4.8. In addition, based on Table 4.7 and Table 4.14, two different sets of forward rates are generated by this pricing method and they are presented in Table 4.12 and Table 4.17.

4.2 The Fees Charged by an Intermediating Bank

Basically, there are three kinds of fees charged by an intermediating bank. They are the hedging fee, the front-end fee and the commission. These will be discussed in the following section.

4.2.1 Different Kinds of Fees

First, the hedging fee is to pay for the bank's work on hedging the forward contract for the parties of the currency swaps. Turning to the front-end fee, it is the amount which the bank needs to start structuring the currency swaps. Finally, the commission is charged when major transactions in the currency swaps are completed by the intermediating banks. Usually, these transactions are the annual interest payments and principal repayments of the currency swaps.

4.2.2 Determination of the Amount Charged

The intermediating bank usually charges 1/4 to 1/2% in fees.[1] In addition, the currency swaps must save around 1/4 to 1/2% of the funding costs[2] of the participants. Therefore, to realize a currency swap, there must be at least 3/4 to 1% of arbitrage between the capital markets.

Besides, negotiation is also an important factor in determining the amount of fees charged. There are a number of elements which affect the parties' negotiating strength. They are listed as follows:

1. Perceived need for the currency swap

If a party perceives that it urgently needs the currency swap, its negotiating strength usually decreases. This case usually occurs when the party uses the currency swap for foreign exposure coverage.

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[1] "The Way To Any Market", Euromoney, November 1983, P.68.

[2] ibid

2. Amount of cost saved

When the currency swap offers a very attractive cost saving, the party's negotiating strength may decrease. This is because the opportunity can be taken up by other parties. Moreover, such an opportunity may never come up again.

3. Availability and need for the currencies

When a party is badly in need of a currency which it cannot obtain easily by some reason, its negotiating strength in the currency swap will decrease. Government regulation can be a reason for such unavailability. The Japanese government's control of the money supply is a good example for this. Usually, such unavailability affects quite a number of corporations. In this case, the currency becomes a relatively scarce resource wanted by many people. Therefore, the party's negotiating strength decreases.

4. Synchronization of cash flow

If the cash inflow and outflow in a currency swap is highly synchronized, the party's negotiating strength will decrease. Synchronization is measured in terms of timing and amount. Synchronization of cash flow brings the least amount of irregularity to the parity. The parity's negotiating strength decrease because it can save funding costs or cover exposure without increasing management's work load.

The synchronization can be the result of similar terms in interest payments and principal repayments. However, this can also be the result of the intermediating bank's active effort in manipulating the hedge. The result of such manipulation is fully illustrated in the "fully arbitraged cash-flow-based pricing method". With this method, the bank can deliver an equal amount of US dollars annually for seven years, while it receives 60% of the client's total Yen payment in the last two

years.

5. Experience in international financial management

When a party is more experienced in international financial management, its negotiating strength increases. This is because it has connection with more financial institutions and is able to get a better bargaining price. Besides, it can evaluate more accurately the attractiveness of the currency swap opportunity. Finally, it usually has access to more capital markets than less experienced parties.

4.3 Chapter Summary

In this chapter, section 4.1 focuses on the pricing of long-date forward contracts and section 4.2 focuses on the fees charged by the intermediating bank. These two areas are the core considerations of the pricing of currency swaps. However, the discussion is still an exploratory one. When the analytical frameworks are put into practice, a number of technical issues will arise for the practitioners to solve.

One major technical problem is the mismatch of maturity days in the hedge of the "fully arbitraged cash-flow-based method" in the pricing of a long-date forward contract. Though it is the best alternative among the pricing methods, mismatch of maturity days in the hedge often occurs. Buying an odd-day short-term forward contract or foreign exchange futures can partly solve this problem. In addition, interest rate futures can be bought or sold for complete closing of the mismatch gap.

However, the calculation of the forward rates will be affected by this complication since extra cost is involved in these actions. A detailed analysis of such calculations is beyond the scope of this research. Nevertheless, this research can be used by the Treasury of

Citibank Hong Kong as a start for analysing the pricing of long-date forward contracts and for identifying opportunities for arranging currency swaps in the Asia Pacific region.

CHAPTER V

OPPORTUNITIES TO ENTER THE DOLLAR/YEN MARKET

The most public manifestation of swaps has been the flood of Eurobond and Swiss bond issues launched to provide the fixed-rate side of the swap. Many corporations borrow low-cost Swiss francs to swap into US dollars. But there is very little potential for a bank in Hong Kong to act as an intermediary or as a counter-party for these swaps.

The opportunity for doing currency swaps in the Asia Pacific region should lie in the US dollar and Yen capital markets. The Asian capital markets are embodied around Singapore, Hong Kong and Tokyo. Singapore has become the centre for Asian dollar deposits. Tokyo controls the Yen market. Hong Kong with its more laissez-faire approach attracts many financial intermediaries to use various currency resources to engage in capital market activity.

The development of dollar/yen swaps relates closely to the Japanese financial system. Japanese banks are emerging as major international lenders; Tokyo is evolving into a major international capital market; interest rate movements will be deregulated. These rapid changes have created extensive potential for swap engineers. In particular, the internationalization of the Yen and the liberalization of long-term Yen bonds are critical. These structural changes have gathered pace during the last few years.

5.1 Structural Changes in the Japanese Financial System

Control over financial transactions took shape rapidly when Japan began to reconstruct its economy immediately after the War. The authorities enforced tight control over the activities of private financial institutions. A regulated low interest-rate policy was

adopted to stimulate economic growth. As a result, Japan's financial transactions centred on the banks. The development of the money and capital markets were hindered. Finally, the free movemernt of funds to and from overseas markets was not allowed.

The financial climate began to change after the oil crises. The greatest factor for the change comes from the economic structure. Japan's economic growth rate has moderated to within 3% to 5% a year, not the 10% of past years. A lower growth rate calls for a more efficient financial system. Financial institutions must innovate, and companies and households are becoming more interest-rate sensitive. This stimulates the development of an open market, adding to the pressure for deregulation.

Financial institutions in Japan are striving for internationalization. First, capital raised in Japan by non-residents has grown. Second, financing by Japanese companies in overseas markets has also been on the increase since 1979. Finally, portfolio investment in Japan by overseas investors and Japanese portfolio investment overseas have grown rapidly since 1980. The internationalization of the financial markets natually requires deregulation.

Although financial reform in Japan is in progress, the pace is not very rapid. The main reason is that households have stuck to deposits with low interest rates and have been reluctant to switch to open market assets in their portfolio selection. Once the public (which saves more than 18% of its disposable income) becomes more yield-conscious, the movement towards liberalization will become widespread and irreversible.

Since 1977, interest rates have not been regulated in the secondary markets. So the regulated interest rates in the primary markets are always exposed to strong market pressure, forcing the authorities to

alter regulated interest rates rather frequently in accordance with the development of market-determined interest rates in the secondary markets. As interest rates are becoming more deregulated, smooth international capital transactions through financial markets in Japan are facilitated. Liberalization will make it easier for foreign countries to have access to the extra savings of Japan.

5.2 The Internationalization of the Yen

The Yen has rapidly come to play a relatively important role in financial transactions during the past three to four years. But its use is still very limited. Japanese exports denominated in Yen accounted for only 5% of the country's total exports in the early 1970s but nearly 40% now, reflecting the increasing proportion of high quality and knowledge-intensive goods in total exports. In contrast, Japanese imports denominated in Yen only account for 3% of total imports. This is basically because three quarters of total Japanese imports consist of raw materials and fuels which are invoiced mostly in US dollars in the world's primary commodity markets. In other advanced countries, 60% to 80% of exports and 30% to 50% of imports are denominated in the national currency.

There is much potential for increasing the role of the Yen in international transactions. First, the oil crises awoke the Japanese to the fact that a large economy needs an internationalized currency: Japan's largest import is dollar-denominated oil. Instead of keeping the Japanese currency as weak as possible, the Ministry of Finance and the Bank of Japan are aiming for a trade-off rate that keeps the Yen strong enough to moderate imported inflation, but weak enough to keep exports competitive. Export financing in Yen is encouraged.

Second, the Ministry of Finance is now working on a longer-term

solution to increase the proportion of Yen-denominated import financing. There is a possibility of pricing OPEC oil exports in Yen. The Japanese believe that one-third of those imports could be priced in Yen without unsettling domestic financial markets. The next surge in the value of the Yen against the dollar would be favorable to this development.

Third, the development of banker's acceptance markets in Tokyo can enhance the international role of the Yen. Although Japanese firms, particularly large ones, already have easy access to Yen finance for their international trade, the establishment of bankers' acceptance markets would raise the proportion of Japan's exports and imports of manufactured goods denominated in Yen. The change is most likely if international interest-rate considerations allow benefits to be given to enterprises which shift to Yen finance from the currently-dominant dollar finance.

On the one hand, there is much potential for the evolution of a Yen currency block centered in the Asia Pacific region. More than 30% of all two-way trade in Asia is now conducted with Japan. Japan is the origin of more than half of the region's direct foreign investment. The actual commercial demand for the Japanese currency is a prerequisite for the development of currency swaps involving the Yen. On the other hand, the Japanese authorities only want a "gradual" program to take place. The US Treasury Secretary, Mr. Donald Regan, is pushing the liberalization very hard. But the Japanese have not yet agreed to moves that could lead to a flourishing worldwide market in bonds denominated in Yen. However, some changes in this area have been enacted.

5.3 The Liberalization of Bonds Denominated in Yen

The liberalization of bonds denominated in Yen is important for two reasons. First, less restrictions on the issue of Yen-denominated instruments would accelerate the internationalization of the Yen. Second, as bonds denominated in Yen become more popular, there are more opportunities for arranging dollar/yen currency swaps.

In the past 10 years to the end of fiscal 1980, the outstanding volume of yen bonds rose from 28% to 63% of GNP. The Japanese bond markets has developed into a major source of funds for public and private borrowers. To speed the internationalization of the yen, the Ministry of Finance authorized the establishment of several markets where foreign borrowers could raise funds through yen-denominated securities. Rules governing the issuing of unsecured bonds in the domestic market are being relaxed. The relaxed rules are now extended to issues in the Euroyen market. Deregulation will allow the bond markets to mature and eventually reach a level of sophistication normally found in a country with an economy the size of Japan's.

The Japanese bond market is comprised of two main sectors: the primary issue market and the foreign yen bonds market. In terms of volume, the primary issue market is much larger than the foreign yen bonds market and grew at a very rapid pace during the 1970s. In fiscal 1980, new primary issues of all types amounted to Y36.77 trillion, or 5.9 times the level floated 10 years earlier. Outstanding issues grew 7.3 times to Y154.09 trillion. In contrast, foreign yen bond issues of all types amounted to Y2.351 trillion by the end of fiscal 1980.

Slower economic growth since the 1973 oil crisis has brought a large budget deficit. In fiscal 1974, the central government was authorized to issue bonds to make up for the deficit. In fiscal 1980,

the public sector accounted for 75.2% of all outstanding bond issues in Japan. The glut of government paper has crowded out domestic corporate issuers, forcing them to turn to Europe to issue bonds.

5.3.1 The Primary Issue Market

The composition of primary bond issues in Japan by type of bond in 1980 reflects the fact that private corporate issues have been crowded out of the bond market (see Table 5.1). Their share of new issues fell from 11.8% in fiscal 1970 to only 3.0% in fiscal 1980.

Table 5.1 Primary Bond Issues in Japan by Type of Bond in Fiscal 1980

Type of Bond	Share (%)
Central government bonds	41.3
Government guaranteed bonds	12.3
Local government bonds	5.8
Public sector total	59.3
Corporate bonds	3.0
Bank debentures	36.9
Yen-denominated foreign bonds (Samurai bonds)	0.8
Private sector total	40.7
Total	100.0

Note: Out of a total amount of Y36.77 trillion

Source: Industrial Bank of Japan

Of the different types, government guaranteed bonds and corporate bonds are the primary targets for currency swaps. Among the many public corporations which exist in Japan in which the government holds equity, 31 are legally allowed to issue government guaranteed bonds. By fiscal 1980, 21 bodies had done so, and 19 still had issues outstanding. The amount of bonds to be issued by each body is determined every year by the Ministry of Finance. Recently, the Ministry has began increasing the number of quasi-governmental entities that are allowed to issue their own bonds directly.

Japan Air Lines (JAL), theoretically a private company listed on the Tokyo Stock Exchange, is in practice a government entity, with 38% of its shares held by the Ministry of Finance. JAL is one of the corporations allowed to issue government guaranteed bonds. In fiscal 1983, it had 10 domestic bond issues outstanding. Because JAL has to pay for new aircraft and aviation fuel in US dollars out of a mixed bag of currencies earned, it is the biggest Japanese taker of currency swaps. In its latest swap deal, JAL is believed to have arranged the largest ever long-term currency swap. JAL's US$75 million was swapped with a package of outstanding debt issues.

The second target that has potential for currency swaps is corporate bonds. There are three principal categories. First, the highest-grade securities are issued by Japan's nine electric power companies. Second, the highest-rated Japanese manufacturing, wholesaling, and retailing corporations issue straight bonds. Finally, since 1966 these same corporations have been allowed to offer convertible bonds.

After the economic crisis of the 1930s, any new bond issues has to be backed by collateral in order to protect investors. By the late 1970s, the Ministry of Finance agreed that the security requirement

should be lifted. In a compromise, uniform eligibility standards are imposed. At first, the rules concerning debt/equity ratio, operating profit, interest coverage, etc. are very strict. Recently, the rules have been relaxed, and more corporations are eligible for issuing unsecured bonds. Direct long-term financing is made easier for private corporations.

5.3.2 The Foreign Yen Bonds Market

An important milestone in the internationalization of the yen was the establishment of several markets where foreign borrowers could issue yen-denominated securities. By far the most popular are yen-denominated public bonds floated in Japan by foreign borrowers, known as Samurai bonds. Growing in importance are Euroyen bonds which are yen-denominated public bonds floated outside Japan -- mainly in the European markets. The liberalization in these two markets provides more opportunities for corporations to tap yen funds. Private placements by foreign borrowers with Japanese institutional investors are also popular. Liberalization during these two to three years has been centred on Samurai and Euroyen bonds. The total amount of foreign yen bonds has grown by 76.6% to Y987.0 billion during 1977-82 (Table 5.2). Future growth is expected to be even faster. As more and more corporations can tap yen funds, the potential for taking currency swaps will also increase.

Table 5.2 The Growth of Foreign Yen Bonds Market

(Amounts in billion yen)

FY	Samurai	Euroyen	Private	Total
1977	454	30	75.0	559.0
1978	657	15	82.0	754.0
1979	284	25	45.2	354.2
1980	280	75	17.5	372.5
1981	613	80	150.0	843.0
1982(a)	690	110	187.0	987.0

Notes: Fiscal year is April-March

(a) Estimates up to March 1983

Source: "More Freedom for Samurai Issuers", Asian Finance, 15 August, 1983, p.48.

Until 1983, a queue system for new issues of Samurai bonds was maintained. The queue could range anywhere from three to 15 months, depending on market conditions. In January 1983, the queue system was compressed into a 3-month timeframe so that borrowers could come to the market much sooner. Effective July 1983, the time for negotiation between issuers and underwriters was also reduced. Now, the same borrower will have the freedom to tap the market as and when it likes, regardless of the interval of two quarters previously enforced between successive issues. Moreover, even first-timers will now be allowed to

make Double-A rated issues instead of the previously obligatory Triple-A rating. All these relaxations mean that there will be a surge in the issue of Samurai bonds.

The second area where there is significant liberalization is Euroyen bonds. In the past only a limited number of foreign governments and international institutions were allowed to make Euroyen issues. Highly restricted guidelines have limited issues to around six a year and to amounts of Y15 billion, except for the World Bank, which can raise up to Y20 billion. Effective April 1984, Japanese companies will for the first time be allowed to issue Euroyen bonds. Under the new guidelines, 30 Japanese companies will be able to issue straight Euroyen bonds, and 90 more will to allowed to issue convertibles. The relaxed rules will allow each company or institution to make one issue a month up to a maximum of Y20 billion. The new rules also end the exclusive right of Japanese security houses to lead manage the issues. These liberalizing measures will facilitate corporations and institutions, both Japanese and foreign, to tap the large pool of European yen funds, which is estimated to be about Y7 trillion, held largely by Japanese banks abroad.

Apart from the bonds discussed, debentures issued by banks, term-loans granted by the long-term credit banks, Samurai loans, etc. may be potential candidates as the yen-leg of dollar/yen swaps. In this respect, fixed rate, low interests, genuine need are essential features. Nevertheless, the growth of swaps depends on whether the Ministry of Finance will liberalize the main character -- currency swaps.

5.4 The Swap Regulator

Currency swaps in Japan are supervised by the Ministry of Finance.

The Ministry acts as the Japanese equivalent of the US Treasury, Internal Revenue Service, Securities and Exchange Commission, and the state banking commissions, and has many of the policy-making responsibilities of the Federal Reserve Board. It also regulates to a certain extent the activities of all financial institutions operating in Japan. The power of the Ministry has no parallel in the United States and the EEC. Hence, understanding the control measures and organization of the Ministry is a key prerequisite for the success of a foreign bank in Japan. This is no exception for currency swaps in Japan.

Currency swaps may create a capital markets problem that regulators do not want to see. The more developed the swap market, the quicker the anomalies between markets will be spotted and exploited. From the point of view of a country's economic policy, there is a danger that domestic interest rates will be hit. In Switzerland, the Swiss National Bank is changing its attitude to dual-currency bond issues because the francs are purely used for their low interest-rate. "If anyone's being exploited here it's the Swiss investors, accepting too low a coupon from a quality US name",[1] said one investment banker.

So for the same reasons, the Japanese Ministry of Finance dislikes yen currency swaps. The rule in Japan is to use existing debt only. New bond issues with a view to arrange currency swaps are not allowed. One result of this pressure to use existing debt is that more swaps are done unpublicized. It is then difficult for the participants to gauge the size of the market, the volume of swaps being done, and the scale of fees and rewards. It also means that a default, even a major

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[1] "The Way into Any Market", Euromoney, November, 1983, p.75.

one, may never be made public.

Currency swaps was a financing option reserved by the Ministry of Finance to government-ralated entities. In November 1983, the Ministry began to make access to swaps more liberal, and widened the permitted combinations of currencies. As a consequence, the market in swaps will probably expand rapidly. Yet, its future will be contingent upon the changes in attitude on the part of the regulators.

CHAPTER VI

EXPLORATORY STUDY ON THE COMMERCIAL NEEDS FOR CURRENCY SWAPS IN THE ASIA PACIFIC REGION

Two industries with suspected high potential to use currency swaps in this region are analysed in detail. They are the offshore oil ventures in China and the shipping industry. This approach of analysing opportunities and needs in terms of specific industries has been widely accepted by major commercial banks. It is believed that the same is also true in applying currency swaps to corporate customers.

Other potential takers of currency swaps can be analysed in the same manner to spot marketing opportunities and problems in the Asia Pacific region. Industry groupings appealing for further exploration include utilities, coal, airline, real estate and banking.

6.1 Opportunities in China's Offshore Oil Ventures

The petroleum import bill in the Asia Pacific region reached a staggering US$72 billion in 1982 (including imports from within the region), with Japan taking up some 70% of the total. Involvement by foreign oil companies has increased dramatically during the past few years. Historically, three areas in Asia have been focal points for exploration and development over the past 20 years: Indonesia, East Malaysia and Brunei. Recently, however, the amount of oil that lies hidden in the sedimentary folds of China's vast continental shelf has attracted a lot of attention. It may well be the richest area in the world waiting to be explored.

6.1.1 Current Development and Future Prospects

Advances in China's modernisation programme will naturally be accompanied by a great demand for energy. Offshore oil exploitation is especially important to the country now that onshore production has been falling. Basically, China is looking for offshore oil to support the petrochemical and related processing industries and to earn foreign exchange through exports. China's stated goal is to double its crude oil production to an average of four million b/d (barrels per day) by the year 2000. Meeting that goal will require increased exploration and development, backed by huge capital investment and technical know-how.

China's attraction lies in its largely unexplored continental shelf which stretches some 18,000 kms, covers an area of about 620,000 sq.kms, including the Bohai Sea Basin, Huanghai Sea Basin, East China Sea Basin, Zhujiang River estuary Basin, Beiba Gulf Basin and Yingge Sea Basin. They could well hold some 30-50 billion tonnes of oil in reserve, according to more modest non-Chinese estimates.

China lacks both the technology and funds necessary for developing the offshore resources. Therefore foreign oil companies have been invited to help the offshore programme get off the ground. China is also drawing the attention of aviation firms and suppliers of ships and other support services.

China National Offshore Oil Corporation (CNOOC), set up under the Ministry of Petroleum Industry (MoPI) to monitor exploration and development of offshore resources, is empowered to sign contracts with foreign companies. During 1980-82, some 50,000 sq.kms offshore area were awarded without bidding to foreign companies for exploration. In the first round of bidding up to the end of 1983 no fewer than 27 oil companies from nine different countries had signed co-operative agreements with China, with 26 companies to work on oil-extraction in the

South China Sea.

In 1982, some 20 wells (16 exploratory and 4 development) were drilled offshore. The success ratio varies from field to field but is encouraging overall. Of 25 exploratory wells drilled up to early 1982, 9 are considerable commercial discoveries, all with moderate depths of 2,000-4,000 meters.

However, contracts signed in the first round of bidding, which commit foreign partners to drill over 120 exploratory wells within three years, emerge with quite disappointing results. Foreign companies find that several Chinese demands, such as costs for Chinese support service, labour and on-the-job training costs and hazy legal requirements create many problems. Overall, China is much tougher in its demands than other underdeveloped oil producing countries concerning operational control, technology transfer and cost sharing. The offshore fields are regarded by many foreign companies as high-cost operations under present terms. Naturally, the commercial exploitation of marginal fields (where the returns on investment are low) would be ruled out. But marginal fields are very common from exploration so far.

Although in exploration terms the poor results do not rule out substantial fields in what is still considered one of the world's last offshore frontiers, they will weaken China's hand in the second round of bidding, to be announced in 1985. Presumably, a new contract model will be released and a new way of dividing up oil shares will be devised. It is also expected that some legal articles would be adjusted and improved by drawing on experience from the first round. Foreign companies are unlikely to leave the oil fields at this stage.

6.1.2 Financing Potential and Obstacles

Financing offshore oil ventures in China should not be a very

different process from that in other oil producing countries around the world. Oil ventures can be divided into four categories: services and supply, rigs and boats, government oil and development finance. The latest estimate, by London brokers De Zoete and Bevan, is that the offshore programme will consume US$75 billion over the next decade; equipment alone will make up US$50 billion of the bill. Earlier estimates were much lower, in the range US$20-35 billion.

Financing services and supply is just like other activities. For rigs and boats, certain special ship financing techniques are involved. Chinese government oil financing poses some unanswered questions. By choice, China will provide half of the funds needed to develop the offshore areas. It is still unknown where China will obtain such a large amount of money. Development finance involves financing the expenditures required to bring a field to production.

Next to equity, bank money is the most common form of oil development finance. Foreign commercial banks will be central to the fundraising effort. Hong Kong's established merchant banking capabilities assure that most syndicated loans will be arranged here. World Bank participation is a strong possibility. The Japanese are pushing hard to get involved. Proximity will make it advantageous for Japan to provide and finance major components of China's offshore development needs.

Presently, China has access to low-rate, long-term financing from organisations such as the World Bank and the International Monetary Fund, besides substantial preferential credit lines with a number of Western governments and Japan. So the prospects for China being a major borrower from foreign commercial sources in the next year or so are probably limited. But, over the next five or six years, it is estimated that China will need over US$10 billion to finance its portion

of the oil development programme, after discoveries are declared commercial.

China, with over US$13 billion in foreign exchange reserves, plus substantial reserves of gold and silver, has no lack of funds. But it may not want to depend on national funds for financing if its oil reserves can provide collateral for borrowing. The Bank of China and CNOOC have made it clear that they expect to raise most of the required funds from foreign financial sources.

There are a variety of forms China financing could take. One strong possibility is for CNOOC to project finance its share of the development similar to the oil companies' method. There can be syndicated floating rates Eurocurrency borrowing. Export credit financing from European, North American, and Japanese sources at fixed rates could also provide funds. Leasing of equipment is very likely. And it is possible that China would like to broaden its activities in the international financial markets by issuing Euronotes or bonds.

Some groundwork has been done in this direction. The Bank of China has become very interested in the concept of project financing, and has set up a special energy division in its head office in Beijing. Chinese officals have indicated that they find the concept of leasing very attractive and four leasing companies -- two in collaboration with foreigners and two domestic entities in eastern China -- have been established. Last year, China launched two successful bond issues in Japan. It seems only logical that financial vehicles such as these should be explored further.

In addition, foreign oil companies will need to raise another US$ 10 billion, mostly for the importation of foreign equipment, in the next five or six years. In the meantime, there will be some opportunities for project financing of smaller magnitudes in hotels, housing

complexes, supplies and equipment joint venture projects, etc. related to oil development.

That is not to say that there would not be obstacles. Traditionally, for ideological reasons, China has been reluctant to borrow. That attitude is changing, but it takes time. There has to be an educational process before new concepts like project financing and leasing get widespread acceptance. Despite mentioning bonds, it is doubtful whether China would want to submit to the required issuance procedures, or whether it would tolerate the rate of return in the foreign bond market. During his recent visit to Beijing, a chemical banker got the impression that some Chinese officals are looking for two per cent interest loans to finance their offshore oil ventures.[1]

6.1.3 Application of Currency Swaps

It is expected that nearly all of the capital expenditures and oil revenues will be denominated in foreign currencies since the Rmb lacks convertibility. The bulk of the transactions will be in US dollars. The Japanese yen will be fairly common, taking into consideration the large Japanese influence in China's oil development and the gradual internationalization of the yen. This would be more so if the Japanese succeed in denominating some of its import oil bill in yen (see section 5.2).

Theoretically, there are many applications of currency swaps

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[1] South China Morning Post, 21 March, 1984.

into fixed-rate yen debt. It may be used for taking advantage of to China's offshore oil ventures. For example, bonds may be issued in Japan and swapped into US dollars to achieve a cheaper all-in cost of capital. Eurodollar syndicated floating rate borrowing can be swapped subsidized export credit financing from European, North American, and Japanese governments while eliminating currency exposure. Currency swaps can also be used to write equipment lease contracts on a hedged basis.

There are many difficulties to be overcome. It may be very difficult to sell the concept of currency swaps to Chinese officials. A prominent Morgan banker here has the experience of trying to "educate" some Chinese officals the mechanism of currency swaps. It appears that it is very hard for them to understand the benefits of a swap transaction, not to say the cash flows involved and the element of long-date forward cover. It is expected that more effort will be spent on making proposals to Chinese organisations, giving advice in negotiations and finding an appropriate counter-party.

Another major limitation concerns the high risk associated with oil ventures. This will make it more difficult for the intermediary bank to act in the middle as a guarantor. Project financing, which will be very important in financing the production phase, is discussed to expose the problems involved.

In project financing, a separate legal entity is usually formed which owns the project. In this instance, a joint venture between a foreign oil company and CNOOC may be created. Suppliers of capital then look to the earnings stream of the project for repayment of their loan or for the return on their equity investment. Part of the capital comes from equity participation by the investors, and the rest comes from lenders and/or lessors. In oil project financing, the primary concern

of banks is whether there are sufficient oil resources in the property dedicated as collateral, and whether they can be produced at an economic rate to ensure an adequate cash flow to operate the project and cover debt service.

There are two basic risks involved. First, the project may not be completed according to the pre-determined plan or schedule. This is called programme risk and arises from the unavoidable lack of precision in engineering assessments and development plans that must be made early in a programme with limited data on the oil reservoir. Second, the project may not generate sufficient cash flows to repay the debt. This is called payout risk and depends on the operator's performance and reliability, market price stability of oil and the political situation.

Of course, the lending banks would require that appropriate completion guarantees be given by the foreign contractor and China, especially at the initial stage of oil production. This provides additional recourse for loan repayment if the primary recourse to the debt is not provided for by sale of the recovered oil due to failure to complete the oil programme as agreed.

But for the intermediary bank involved in guaranteeing repayments, there would be greater exchange exposure risk for this kind of oil project financing. For example, if a Japanese counter-party can repay its US dollar interest and principal obligations, the intermediary bank must pay the corresponding yen interest and principal to discharge the Japanese counter-party's debt. So, if the Chinese oil venture cannot service the debt, the intermediary bank would withhold the US dollar cash flows. The lending bank would have recourse for loan repayments. For the intermediary bank, there is an exchange exposure because it is not prepared to take a long position in US dollar and short position in yen. The intermediary bank may charge a higher fee for this kind of

risk, but the cost will become so high that currency swaps may lose its attractiveness.

6.2 Opportunities in the Shipping Industry

Hong Kong is one of the major shipping and ship financing centres in the world. Many ship financing deals in the Asia Pacific region are arranged in Hong Kong. The impetus behind these financing activities comes from the Hong Kong shipowners, Hong Kong bankers and the "shikumisen mechanism".[1]

Hong Kong shipowners are famous for their ship financing skills. Sometimes, Hong Kong shipowners are described as ship financiers rather than shipowners by people in the shipping industry. Therefore, there should be much opportunity to provide a sophisticated financial product such as currency swaps to the Hong Kong shipowners. The lowering of borrowing costs can be a very attractive element to these sensitive financiers.

Besides, the shipping industry always needs new ships to replace old ones. Such replacement includes scrapping the old one, upgrading and restructuring of the fleet. In addition, the purchase of second hand tonnage will always exist.[2] All these activities will bring new ship financing business to the bankers. Therefore, there will be many opportunities to arrange currency swaps in these ship financing deals.

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[1] This mechanism will be discussed in section 6.2.2

[2] Revell, Michael D. "Good Omens For An Upturn, But Case For Industry Overhaul Strong", Asian Finance, March 15, 1983, P.71.

This section will first analyse the current developments and future prospects of the shipping industry. Then potential and obstacles in ship financing, including the "shikumisen mechanism", will be discussed. Finally, the application of currency swaps in ship financing will be investigated.

6.2.1 Current Developments and Future Prospects

The shipping industry is still facing the problem of surplus tonnage. Ship operating costs are rising. Due to intense competition, the freight rates in many trades are at an historically low level in real terms.[1] Moreover, it was said that the rates should rise 15 per cent to 17 per cent before shipowners can consider building new vessels.[2] Furthermore, a recent OECD study predicts that world trade will not boost the demand for shipping until late in 1984 at the earliest.[3] In short, the shipping industry has over-expanded and it has to enter a period of consolidation. Besides, there are some significant issues worth noticing.

1. Japanese Lines' Improvement Programme

The Japanese lines invest heavily to improve their fleets. An outstanding example is Sanko Line.[4] It ordered 111 ships from the

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[1] Slater, W.B. "Lines' Earnings Lagging Behind", South China Morning Post, April 25, 1984.

[2] ibid.

[3] Sohmen, Helmut. "Shipping Through The Eyes Of Hong Kong Shipowner", Shippers Today, November/December 1983, P.16-17.

[4] "Shipping", Asia 1984 Yearbook, P.90-92.

Japanese shipyards in 1983. Nearly all the ships Sanko ordered are handy-sized bulkers (20-40,000 dwt). However, the company also plans to dispose of a large portion of its fleet.

As a result, the net effect of Sanko's improvemet programme is to reduce its fleet to around 8 million dwt from the current 14 million dwt. Such fleet reorganization is aimed at meeting the market demand, saving the operating costs and keeping pace with competition. Therefore, the prospect for new ship financing deals is not as gloomy as the industry's current performance.

2. Financial Difficulty of Shipping Companies

In 1978, the Japan Line nearly went into bankrupty. Its financial difficulty also nearly brought down Sir Y.K. Pao World's Wide group which heavily relied on Japan Line's charter. In the 1983 financial year, Mitsui OSK, Showa and Y.S. Lines all reported drops in profits. The K-Line had gone into red together with Japan Line. The only Japanese shipping company which reported a rise in profits was NYK Line.[1] Moreover, the chairman of the General Council of British Shipping said that it has been many years since revenues have covered operating costs. He also mentioned that no free enterprise industry could continue to provide services at a loss for long.[2] Furthermore, Hong Kong's second-largest liner company, Hong Kong Islands Line,[3] only narrowly

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[1] "In Brief", Asian Shipping, January 1984.

[2] Slater, W.B. "Lines' Earnings Lagging Behind", South China Morning Post, April 25, 1984.

[3] "Nightmares About Huge New Shikumisen Deals", Far Eastern Economic Review, February 16, 1984, P.40-41.

avoided bankruptcy by selling a 60% stake in its company to the property developer New World Development.

3. Developing Countries' National Flag

Many developing countries plan to become directly involved in their maritime transport and to build up their own national fleets. The People's Republic of China is a good example. It plans to build a new fleet which will increase to 20 million dwt by 1990 and will eventually rise to 30 million dwt by the end of the century.[1]

As a result, these developing countries work against the flag-of-convenience shipping companies (eg. Hong Kong shipowners' Liberia, or Panama, registered ships) and demand for a "genuine link". That is, there should be a real link between the ship's registration and the nationality of the ownership. Besides, many developing countries suggest the practise of the 40-40-20 Liner Code concept which calls for the splitting of cargo share 40% for the importing country, 40% for the exporting country and 20% for third parties. If these two concepts are put into practice, they will seriously hurt the Hong Kong shipping community.[2] Therefore, the Hong Kong shipowners try to form joint ventures in the region -- with countries like Indonesia, Malaysia, the Philippines and Thailand which need shipping services.

6.2.2 Financing Potential and Obstacles

The most famous ship financing technique used by the Hong Kong

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[1] Lauriat, George. "Tremendous Peking Newbuildings To Double The Fleet By 1990", Far Eastern Ecomonic Review, February 16, 1984, P.35-36.

[2] Lauriat, George. "No More Buccaneering After 1997, My Hearties", Far Eastern Economic Review, February 16, 1984, P.42-49.

shipowners is the "shikumisen mechanism". In addition, leveraged leasing is now gaining in popularity.

1. "Shikumisen Mechanism"

Basically, the "shikumisen mechanism" involves a charter, that is, a lease. Its advantage mainly comes from tax savings, lowering of operating costs and obtaining low interest export credit. To illustrate the basic "skikumisen mechanism", the Japanese trading house and the commercial banks are taken out and the simplified picture is shown in the following diagram.

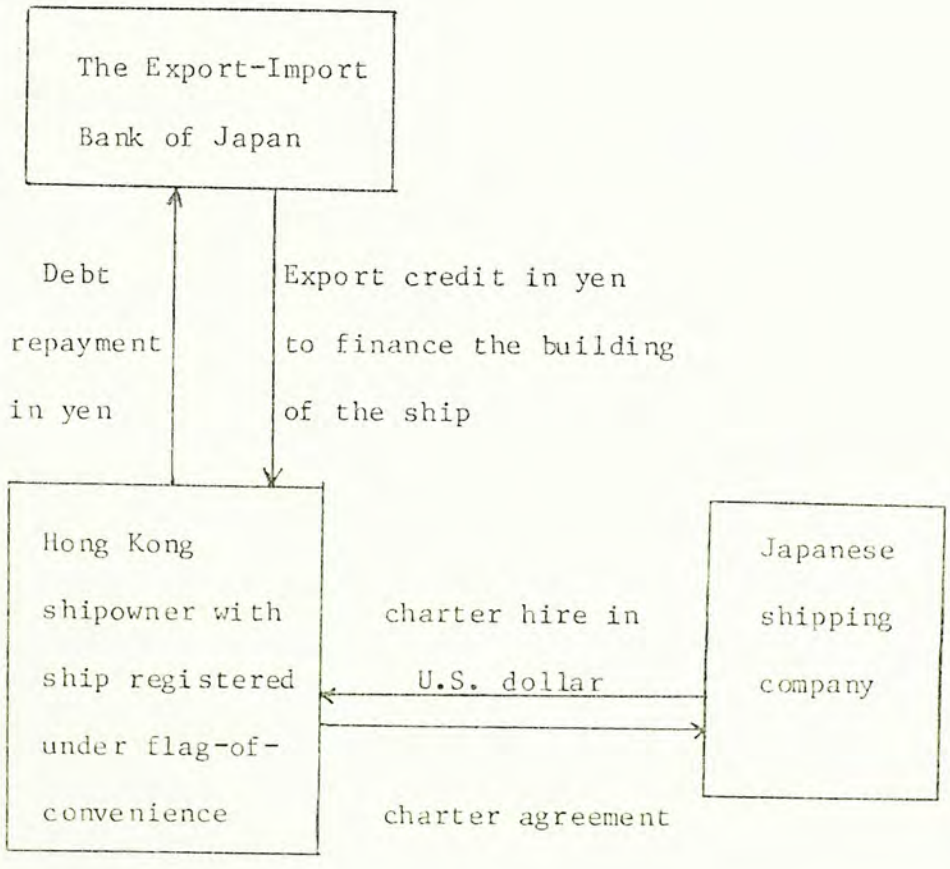

Figure 6.1 Basic Framework of the "Shikumisen Mechanism"

In Figure 6.1, the Hong Kong shipowner can obtain the low interest and fixed-interest yen export credit to finance the building of the ship. If the Japanese shipping company directly orders the ship from Japanese shipyard, it cannot obtain the export credit from the Exim Bank. Besides, the ship is registered under a flag-of-convenience (FOC). This provides tax savings for the Hong Kong shipowner since the FOC countries are tax havens. Under FOC, the operating costs for the Japanese company is lowered, since cheaper crew can be employed.

However, the Japanese shipping companies started setting up their own subsidiaries in offshore centres such as Singapore and Hong Kong to substitute for the role of the Hong Kong shipowners in the traditional "shikumisen". The new arrangement was called "false shikumisen". That means, the Hong Kong shipowners' opportunities are being taken away. Nevertheless, the Hong Kong shipowner was allowed to participate on a 50:50 basis in many cases.[1]

2. Leveraged Leasing

This is a kind of leasing with part equity/part debt financing. As a result, it provides a further tax offset in the form of deductible interest payments and further lowers the lease payments. It is gaining more popularity in the region as corporations become increasingly sophisticated in their tax planning.

6.2.3 Application of Currency Swaps

Currency swaps can be built into ship financing in two ways. The

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[1] Lobo, G.A. Hong Kong Shipping : The Inside Story, Lloyd's of London Press, Ltd., 1981, P.105.

first one utilizes the "shikumisen mechanism" and the second one makes use of the yen-denominated lease.

1. Utilizing the "Shikumisen Mechanism"

The low interest and fixed-interest export credit from the EXIM Bank provides a very good source for capital markets arbitrage.

In Figure 6.1, the Hong Kong shipowner receives the charter hire in US dollar but repays the debt in yen. This creates a foreign exchange exposure for the shipowner. Especially in these few years, the fluctuation of yen/US$ exchange rate has made foreign exchange exposure in yen highly undesirable. Therefore, the Hong Kong shipowner should be highly motivated to hedge against this exposure. Obviously, this creates an opportunity for the Bank to arrange yen-U.S. dollar currency swaps for the shipowner to hedge against the yen exposure.

On the other hand, there should be a considerable number of organizations wanting to be the counter-parties for such yen-U.S. dollar currency swap. These organizations include U.S. companies which have or will have direct investments or portfolio investments in Japan, large Japanese companies which can raise fairly low cost U.S. dollar funds, Japanese companies which have U.S. dollar-denominated debt, and companies which want to get low-interest and fixed-interest funds. These kinds of organizations are increasing in number. The reasons behind this increase include increased foreign investment in the Japanese market, internation- alization of Japanese banks, increased activity in exchange exposure management in Japanese corporations, and the low interest rate in the yen capital market.

In short, the potential for arranging currency swaps for Hong Kong shipowners through the "shikumisen mechanism" should be fairly great. Besides, when the Hong Kong shipowner is replaced by a subsidiary of a Japanese shipping company, the currency swap can still be arranged for

the Japanese subsidiary through the "false shikumisen".

If the transactions are illustrated in a diagram, they will be as follows:

Future interest payments and principal repayments

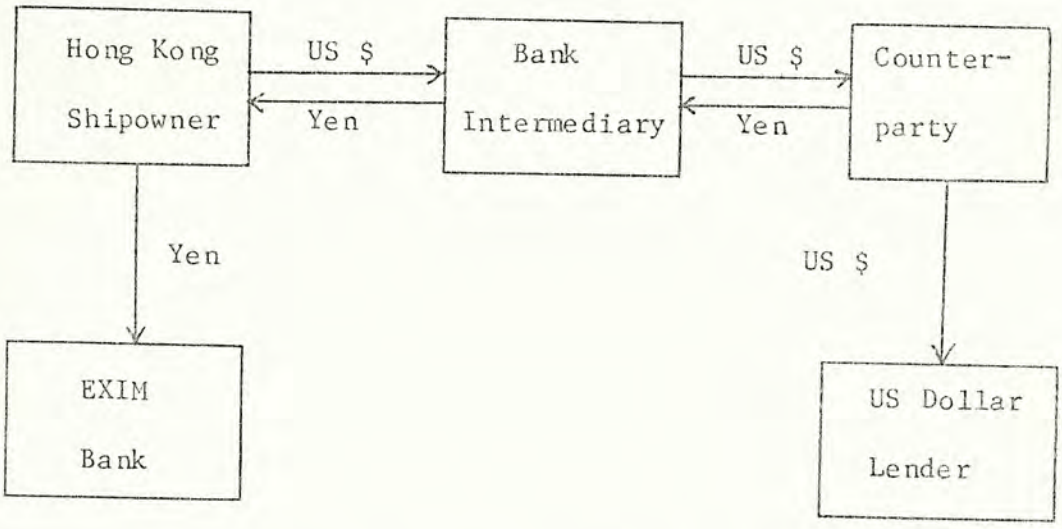

Figure 6.2 Currency Swaps Utilizing The "Shikumisen Mechanism"

2. Utilizing Leveraged Leasing and the Lessee is U.S.-based

When the lease is yen-denominated and the lessee is U.S.-based, there will be an opportunity to arrange a currency swap for the lessee. Though there is considerable variation in leasing agreements, the basic framework of such currency swaps can be discussed.

One basic factor for such currency swaps is that the lessee should want to hedge against the yen-denominated lease payments. Therefore, the currency swap offer an efficient tool for them to hedge against this foreign exchange exposure. The potential counter-parties are similar to those in the section, "utilizing shikumisen mechanism". The basic transactions are shown as follows:

Future payments

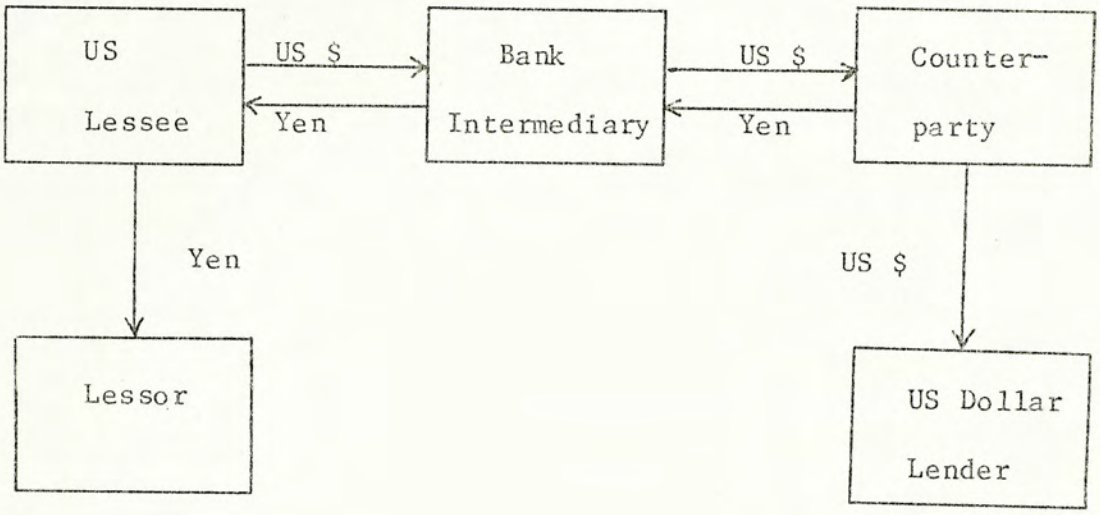

Figure 6.3 Currency Swap Utilizing the Yen-denominated Lease

CHAPTER VII

RECOMMENDATIONS AND CONCLUSIONS

7.1 General

Currency swaps provide a great challenge to the banking mind. There are unlimited possibilities and combinations of markets, clients and risks.

The first step for a bank to enter the swap business is to analyse its access to capital markets, client base, risk management ability and marketing strength. Knowledge of the bank's organization and what it can do is as important as innovative ideas. A competent task force with strong technical expertise and marketing skills has to be built.

7.2 Pricing of Currency Swaps

As described in section 4.1.4 (summary of section 4.1 "pricing of the long-dated forward contract"), the "fully arbitraged cash-flow-based pricing method" is the best pricing method since foreign exchange exposure is fully hedged. Though the "exchange of borrowings method" is alos fully-hedged, the method is only applicable in limited cases.

Nevertheless, there are still a number of technical problems to be solved in using the "fully arbitraged cash-flow-based method". One of these is the mismatch of maturity days in the hedge. The using of financial futures to close the mismatch is proposed. But, the exact calculation of the cost involved in these transaction is left to the practitioners in the financial futures market to formulate.

Besides the above proposal, the Treasury of Citibank Hong Kong can also try to participate in the international bond markets. If the organizational issues in the Bank are disregarded, the trading of international bonds will complement the Treasury's operation in money

markets and foreign exchange markets. Particularly, many international securities are fixed-rate. They are ideal components to structure the hedge in the "fully arbitraged cash-flow-based method".

Finally, active monitoring of arbitrage opportunities among capital markets also allows the Treasury to offer attractive forward prices of the currencies. Such attractive prices, in many cases, constitute the core element in currency swaps which are created to save finding costs for corporations. If the Treasury is sensitive enough to catch these long-term arbitrage opportunities quickly, it may be able t9o arrange fully hedged dual-currency swaps which are still the pride of Morgan Grenfell up till now.

Turning to the determination of fees charged, the importance of the negotiation factor is discussed. Therefore, the marketing officers for currency swaps should be equipped with negotiating skills and well-informed about the customers' positions.

7.3 The US Dollar/Yen Market

The US dollar/yen market has great potential for currency swaps in the Asia Pacific region. The regulators in Japan, however, dictates to a large extent what can be done in this market.

The current liberalization of the Japanese financial system should be tracked closely. The changing attitude of the Ministry of Finance towards currency swaps is of particular importance.

7.4 Commercial Needs

It is helpful to understand the need, potential and application for currency swaps in terms of industry groupings. Oil, shipping, airline, utilities, coal and even banking are suitable candidates for further study. Some exploratory study has been devoted to the oil and shipping

industries in this report.

7.4.1 China's Offshore Oil Ventures

The potential for commercial banks to lend to foreign oil companies and perhaps the Chinese Government is great. The import of capital equipment and the export of oil will involve transactions in foreign currencies of substantial size. However, it will take some time for the Chinese officals to understand the world financial markets, and to employ oil financing techniques like project financing, leasing and swap mechanisms.

Patience, education and negotiation are essential for developing a swap business with the Chinese. As an intermediary bank, the exchange exposure involved in guaranteeing default risk should be thoroughly understood.

7.4.2 Shipping Industry

Citibank Hong Kong has a separate division working on ship financing. The Bank has great opportunity to arrange currency swaps for the industry since it has a large client base.

Currency swaps utilizing the "shikumisen mechanism" and yen-denominated lease in ship financing and discussed in section 6.2.3. Marketing of the sophisticated financial product can start with those large shipowners who are financially more sensitive. Moreover, shipowners with large yen-exposure are also good targets.

Finally, Japanese shipping companies should be a large market with high potential. They are financially sensitive since most of them have experienced declines in profits. They are investing heavily in fleet improvement programmes. Moreover, Japanese shipping companies are setting up subsidiaries in Hong Kong (or Singapore) to structure "false

shikumisen" deals described in section 6.2.2. Adding these to the growing sophistication in exposure management in Japanese commercial circles, the Japanese shipping companies should be a very rewarding market to be expored.

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